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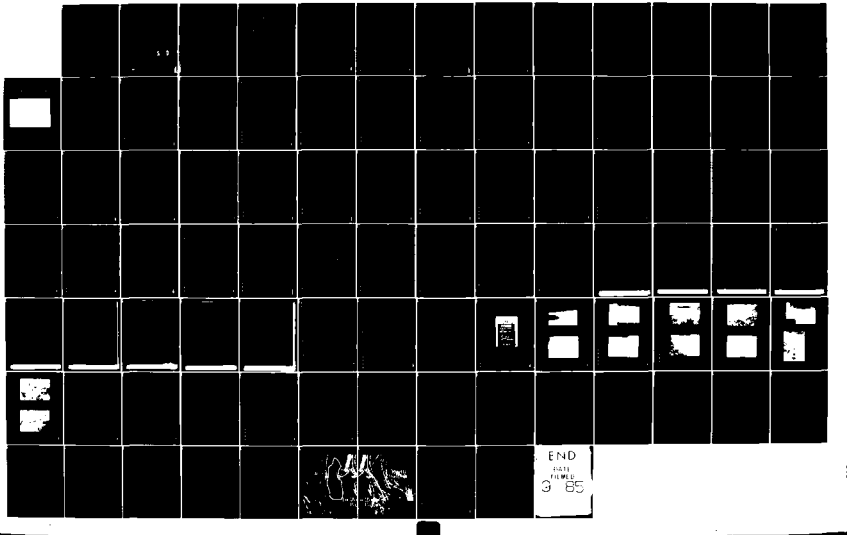

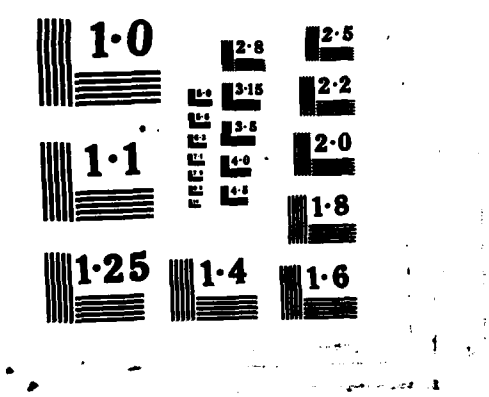
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CONNECTICUT RIVER BASIN
BELLOWS FALLS

MINARDS POND DAM
VT00154

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1978

UNCLASSIFIED

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Bellows Falls, VT.
Unnamed Stream

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is a 25 ft. high earth fill with a crest length of 700 ft. and a crest width ranging from 10 to 15 ft. It is small with a significant hazard potential. The dam is in poor condition. There is no means available for lowering the pond level in the event of emergency. An annual maintenance inspection program and an annual technical inspection program should be established. An effective flood warning system should be established and tested regularly to protect downstream residents.

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REPLY TO
ATTENTION OF:

NEDED

1 8 1979

Honorable Richard A. Snelling
Governor of the State of Vermont
State Capitol
Montpelier, Vermont 05602

Dear Governor Snelling:

I am forwarding to you a copy of the Minards Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Water Resources, the cooperating agency for the State of Vermont. In addition, a copy of the report has also been furnished the owner, Bellows Falls Village Corporation, P.O. Box 370, Bellows Falls, Vermont 01501, ATTN: Mr. Peter LaHaise.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Water Resources for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

MINARDS POND DAM

VT00154

VILLAGE OF BELLOWS FALLS, VERMONT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NEDVT00154
Name of Dam: Minards Pond Dam
Town: Village of Bellows Falls, Town of Rockingham
County and State: Windham County, Vermont
Stream: Unnamed Stream
Date of Inspection: June 21, 1978

BRIEF ASSESSMENT

Minards Pond Dam is a 25 foot high earth fill with a crest length of 700 feet and a crest width ranging from 10 to 15 feet. The downstream slope is about 1.2H to 1V in the upper zone of the dam and the upstream slope may be about 2H to 1V. A rubble core-wall is shown to extend to within 3 feet to 4 feet from the top of dam. The dam has one small overflow structure with its invert about 3 feet to 4 feet below the top of dam.

The reservoir, which is used as a water supply, has a drainage area of 144 acres and a surface area of 47.5 acres.

Minards Pond Dam is classed as "small" and has a "significant" hazard rating.

Minards Pond Dam is in poor condition. The downstream slope is considered marginally stable because it is steep; it apparently sloughed in about 1974 and it is covered with several large-sized rotting roots of trees that were cut soon after 1974. In addition, there is no emergency spillway. A 70 foot long grassed low spot (about 1.2 feet deep) on the crest would act as an unintentional spillway, in which case the dam is likely to wash out. There is no means available for lowering the pond level in the event of emergency.

Minards Pond would essentially reach the top of the dam during the test flood (1/2 PMF). If the drainage areas from Farr and Ellis Brooks are inadvertently turned into the pond, by opening valves that are normally closed, the dam would be overtopped.

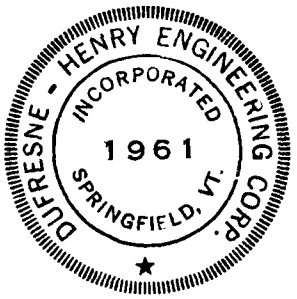
It is recommended that a thorough stability analysis of this dam be made, that an emergency spillway be provided, that a high-capacity outlet be installed to permit draining the pond, and that the large rotting stumps on the downstream face be removed using a carefully-controlled technique to avoid danger to the dam.

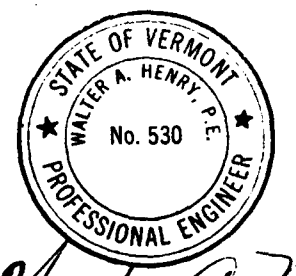
An annual maintenance inspection program and an annual technical inspection program should be established.

An effective flood warning system should be established and tested regularly to protect downstream residents.

Until the above recommendations are carried out, the pond must not be allowed to rise above its present elevation of 612.7 feet.

Further recommendations are given in Sections 7.2 and 7.3.





Walter A. Henry

This Phase I Inspection Report on **Minard's Pond Dam** has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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The nature and location of the overflow structure at Minards Pond indicate that it could easily become clogged and inoperable during high lake levels. The concrete of the structure on the downstream end of the pipe is cracked, misaligned and has no footing. Erosion is taking place at the end of the pipe and may cause it to collapse the head wall and squash the metal pipe.

The overflow outlet structure, which is an auxiliary spillway during periods of high flows, is in good condition. The entrance channel training walls are of dry stone masonry construction and the outlet structure is concrete (see Photo 6).

The trash rack is adequate but some debris has built up in front of the outlet conduit. The conduit is a 36-inch diameter corrugated galvanized metal pipe. As indicated in Fig. 1 the conduit has two bends before exiting into the discharge channel.

The head wall at the outlet end of the conduit is cracked, misaligned and there is no apparent footing for the structure (see Photo 7). Erosion is taking place under and downstream of this headwall.

d. Reservoir Area

The reservoir area consists of approximately 47.5 acres at normal pool level. Because the primary water sources for the reservoir are ground water springs and diverted stream flow carried in pipes, sedimentation is not a problem. Aquatic growth also appears to be inconsequential.

e. Downstream Channel

A small stream channel fed by seepage from the toe of the dam, the abandoned outlet conduit, and the overflow conduit, exists below the dam. This stream flows in a northeasterly direction for approximately 0.8 miles before entering the Connecticut River. The overbank areas are relatively wooded and the channel itself is overgrown. It receives only minor flow most of the year.

3.2 Evaluation

Based on the visual inspection it appears that the embankment could be only marginally stable, since the downstream slope is steep, the reservoir level apparently was raised without widening the dam, and sloughs on the downstream slope apparently have been observed in about 1974.

There is no spillway and no low level outlet to permit lowering the reservoir level in the event of emergency. The top of the dam has a 70 foot long grassed zone that is about 1.5 feet lower than the remainder of the crest. This zone would act as a spillway and would lead to possible washout of the dam if the water rose to that level.

The crest is very irregular in elevation (Fig. 3). In addition to the low zone on the left end, there are a few low spots in the crest where runoff concentrates and causes erosion locally on the downstream slope. Also, the downstream crestline is generally a few tenths of a foot lower than the upstream crestline.

There is no information available concerning the several raisings of the dam mentioned by Mr. Thomas. However, it appears that the last raising was about 3 feet high, since the upstream slope consists of a vertical rubble stone wall about 3 feet high, followed by a sloping upstream face that disappears under water. Thus the last lift seems to have been added to the crest alone, without widening the base. The water level at the time of inspection was about 4 feet below the present crest, which means it is nearly at the crest of the dam as it existed previously.

The riprap on the upstream face is slightly wave-cut, and there appears to be no filter material between it and the embankment. This "wave-cut" face may not in fact be due to wave action; rather it may be the intersection between the vertical rubble wall and the old slope. In many zones the vertical wall has apparently degraded, leaving the appearance of a wave-cut shore.

c. Appurtenant Structures

The appurtenant structures associated with Minards Pond are in good condition, with the exception of the gate house foundation which is described below.

The gate house, Photo 3, controls the flow from the water supply reservoir to the distribution system for the Village of Bellows Falls. The foundation is mortared granite blocks with outside wall dimensions of approximately 13 feet x 15 feet.

There is a crack in the east face of the foundation wall (see Photo 10). Remedial action was taken to insure the structural stability of the gate house foundation. This was accomplished by installing angle irons with brackets at each corner and connecting them with two 3/4-inch-diameter galvanized steel rods (see Appendix B, Exhibit E). As a result of this action the structure is in stable condition.

The service bridge was recently repaired and is in good condition. Treated wood piles have been driven to provide the foundation and support the bridge. The bridge consists of a walk approximately 6 feet wide of 2" x 6" planks supported by 4" x 10" beams with cross ties of 2-3" x 14" members at each pile. The piles on the dam end were driven not more than 6 feet deep, according to Mr. Thomas.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

This dam is in poor condition. The freeboard is 3 feet; there are many large rotting stumps in the downstream face of the embankment; there are local low zones in the crest; and there is evidence of past sloughing of the downstream face; and the level of the pond cannot be lowered appreciably.

b. Dam

There is a low zone at the left end of the crest of this dam which is about 70 feet long and about 1.2 feet below the highest crest elevation. This zone will act as a spillway if the pond level rises, since there is no other spillway. The surface of this zone is grassed. A profile of the crest is shown in Fig. 3.

Seepage is occurring at both the left and right downstream abutment contacts, as well as through the old (unused) discharge channel (Photos #8 and #9) and from a point about 25 feet to the right of this old channel at the toe of the dam (Photo #13). All seeps were clear at the time of inspection. Two cross sections of the dam were taken, as shown in Fig. 2. Between these two cross sections the lower part of the downstream slope appears to have a berm-like feature. A similar feature occurs 60 feet left of the leftmost cross section. In approximately 1974 Mr. Michael Peloso of Dufresne-Henry Engineering Corporation visited this site in connection with a comprehensive water supply study. At that time he observed these berm-like features, which were exposed soil at the time. These features appeared to be the result of a slough, so he brought them to the attention of the Department of Water Resources. There is now no apparent evidence of any scarp that may have been formed; only these local wide berm-like features exist.

On the downstream side, at the time of Mr. Peloso's visit in 1974, many large trees were growing. These trees have since been cut, leaving rotting stumps as large as two feet in diameter. During the present inspection, the downstream slope was covered with shrubs and stumps. (Subsequent to the inspection the brush and shrubs have been cut.)

Several animal holes were found on the downstream slope.

2.3 Operation

Operational procedures during unusually dry periods consist of directing water into Minards Pond via pipe lines from two brooks located in another watershed. These pipes are valved and are usually in the closed position. There is no mechanism provided to drain the pond in the event of an emergency situation.

2.4 Evaluation

a. Availability

The 1939 plans for intended improvements are on file in the Village Manager's office. Copies are appended to this report as Exhibits A, B and C.

b. Adequacy

The plans appear adequate. No design computations are available.

c. Validity

Not all of the intended improvements were carried out. In particular, the proposed spillway was not built and the slopes were not flattened.

SECTION 2: ENGINEERING DATA

2.1 Design

In one set of 1939 plans, Exhibit A, Appendix B, it was proposed to raise the dam 7 feet. In a second set of plans, it was proposed to raise the dam 6 feet. The dam crest was at elevation 121 prior to raising (USGS El. 613) and is currently at elevation 615.5. Hence, it appears to have been raised only 2.5 feet. This change in elevation is consistent with the current freeboard of 3 feet, since the water level is about the same now as it was prior to 1939.

2.2 Construction

Mr. Thomas indicated that the last raising probably was carried out in the 1930s by the Civilian Conservation Corps (CCC). The elevations as they exist now, as compared with the elevations prior to the 1939 proposed improvements (Exhibits A-3, Appendix B) indicate that the dam was raised 2.5 feet some time after October 1939. The old photograph of the dam (Photo 2, Appendix C) shows a roadway leading to an old gate house. That roadway was submerged about 4 feet on June 21, 1978, which means it is at elevation 608 to 609. The dam, as shown in that photograph, appears to be no more than one foot above water, i.e., elevation 609 to 610. Thus, it appears that the following changes have occurred:

Time	Approximate Elevation of Top of Dam - USGS MSL
Photograph 2, Appendix C	609 to 610
Prior to 1939 drawings, Appendix B	613 to 613.5
June 21, 1978	615.1 (min.) to 616.3 (max.)

Of the proposed improvements shown in the 1939 plans in Appendix B, it is apparent from the field inspection that the downstream face of the dam was never filled to 3H:1V nor was the concrete spillway constructed. Fig. 2 shows two cross sections of the dam on June 21, 1978.

(6) Zoning

None known.

(7) Impervious Core

Rubble core wall to approximately elevation 612.5 presumably constructed to serve as an impervious core. Thickness about one foot at top and 2 feet at bottom, see Exhibit A, Appendix B.

(8) Cutoff

None known.

(9) Grout Curtain

None known.

i. Spillway

No spillway exists at Minards Pond.

j. Regulating Outlets

There are two outlets at Minards Pond, an overflow and the water supply line to the chlorination building. The overflow is a 36 inch diameter corrugated metal pipe, 110 feet in length. The intake of the pipe is housed in a concrete structure which is also the trash rack (Figure 4, Photo 6). The pipe invert is set approximately 3 feet below the lip of the opening in the trash rack. The elevation of the invert is ±609.7 feet m.s.l. and the lip of the trash rack is at ±612.7 feet m.s.l.

The 110 feet of pipe which constitute the overflow is laid out in an open U-shape, making a 90° bend approximately 20 feet from the entrance and followed by a 45° bend approximately 30 feet from the exit. The differential elevation between the upstream pipe invert and the downstream pipe invert is 1.5 feet. Hence, the invert at the discharge side is at elevation 608.2.

The outlet from the pond is the 20-inch cast-iron water supply line located approximately 23 feet below the dam crest. After passing beneath the dam, the pipe couples to 16 inch pipe before entering the chlorination building. The 20 inch supply line is gated.

d. Reservoir Data

	Feet
Length of Maximum Pool	2700
Length of Normal Pool	2300

e. Storage Data

	Acre-Feet
Normal Pool	665
Design Surcharge	826
Top of Dam	826

f. Reservoir Surface Area

	Acres
Top of Dam	51
Maximum Pool	51
Normal Pool	47.5

g. Dam

(1) Type

Earth fill dam, based on visual observations. A rubble core wall with top at about elevation 612.5 is shown in Exhibit A, Appendix B.

(2) Length

Approximately 700 feet.

(3) Height

Maximum height approximately 25 feet.

(4) Top Width

Variable 10-15 feet.

(5) Side Slopes

Upstream face 2H:1V
Downstream face:
Upper two-thirds of dam - 1V:1.2H to 1V:1.5H
Lower third of dam - 1V:3H or flatter

The natural watershed of Minards Pond contains no continuously flowing streams. Water enters the pond in the form of storm runoff, direct precipitation and ground water. A large enough portion of the supply comes from ground water (springs) to prevent freezing of the pond occasionally. (The average January temperature in this area is 19° F.)

Minards Pond is a bedrock lake (i.e., very shallow soil cover). The pond and drainage basin are underlain by the Littleton Formation, a gray phyllite grading into a mica schist of Devonian age. Soils within the drainage basin were formed in the upland glacial tills and below to the Woodstock-Paxton-Woodbridge Association as per the Soil Conservation Service Survey. These soils are somewhat excessively drained to moderately well drained and commonly are associated with a hardpan within three feet of the surface.

b. Discharge at Dam Site

(1) Outlet Works

The outlet works at Minards Pond consist of a single 36-inch corrugated galvanized metal pipe (CGMP) at the right abutment contact of the dam. The upstream pipe invert is at 610.1 feet MSL; however, discharge through the pipe will not occur until the trash rack lip is overtopped. Lip elevation is ± 612.7 feet MSL (see Figure 4).

In addition to this outlet a 20-inch pipe which supplies water to the Town water system is located at an elevation of 590.2 feet MSL.

(2) Maximum Known Flood at Dam Site

There are no records of flooding at Minards Pond.

(3) Spillway Data

Minards Pond has no spillway; however, as shown in Figure 3, there is a zone near the left abutment that is about one foot lower than the remainder of the crest. Overtopping would begin in this zone, where the crest is at elevation 615.1.

c. Elevation Data

	Elevation (assumed feet MSL)
Top of Dam (maximum)	616.3
Top of Dam (minimum)	615.1
Maximum Pool - Design Surcharge	615.1
Normal Pool	612.7
Overflow Structure Upstream Invert	612.7
Streambed at Centerline of Dam	591.5

e. Ownership

Minards Pond is owned by the Bellows Falls Village Corporation, a municipal entity.

f. Operator

The individual responsible for the daily operation is Village Manager, Mr. Peter LaHaise, P.O. Box 370, Bellows Falls, Vermont 05101. Telephone 802-463-3964.

g. Purpose of Dam

The dam's sole purpose is to impound water to provide a water supply reservoir known as Minards Pond to serve the Village of Bellows Falls.

h. Design and Construction History

Minards Pond Dam reportedly was constructed in the early 1800s. No data are available concerning its original design or construction. Subsequently, the dam was raised at least once. Plans for the last raising were drawn in 1939 and are contained in Appendix B, Exhibits A and B. It appears that the dam was raised only 3 feet after 1939, rather than the planned 6 feet. A spillway was planned at that time, Exhibit C, but was not built. Mr. Donald Thomas (former Village Trustee) indicated verbally that the dam has been raised at least three times, but no records of other raisings are available.

i. Normal Operating Procedures

Normal operating procedures consist of mowing the grass on the crest of the dam. Large trees were cut off the downstream face of the embankment in about 1974 and the stumps were left in place.

Periodic inspection of the gate house is made to ensure proper operation of the water supply intake facilities.

1.3 Pertinent Data

a. Drainage Area

The total drainage area which supplies Minards Pond is 525 acres. Of this total, only 144 acres constitute the natural drainage area of Minards Pond. The remaining 381 acres of drainage area come from Ellis Brook and Farr Brook. The run-off from these two brooks is collected and diverted into Minards Pond by means of a network of 8-inch pipes. These pipes are the only means by which water from the Ellis Brook and Farr Brook watershed may enter Minards Pond. Because this pipe network is gated and opened only to help maintain the reservoir during dry periods or periods of excessive water consumption, the Farr Brook and Ellis Brook watersheds were not included in the hydrologic analysis of Minards Pond.

b. Description of Dam and Appurtenances

The dam is an earth fill structure with a rubble core wall. The upstream face has riprap exposed above pond level with a slope about 2H:1V. The downstream face has a variable slope of 1.2 to 1.5H:1V. The crest elevation of the dam varies 1.5 feet over its length of 700 feet.

The gate house is of wood frame construction with a masonry block foundation. Coarse filter screens and the control gate for intake into the municipal water system are located in the gate house. A wooden ramp supported on pile foundations provides access from the dam to the gate house.

A low level discharge originally existed at a point about 241 feet right of the access ramp to the gate house. It was subsequently plugged by dumping material on the upstream side and is no longer used. The outlet of this low level discharge is still visible at the toe of the dam (see Photos 8 and 9 in Appendix C).

A reservoir level control structure exists at the right abutment. This structure is shown in Fig. 4 and Photo 6 of Appendix C. The outlet from the level control structure is a 3-foot diameter CMP culvert, the downstream side of which is shown in Photo 7 of Appendix C.

c. Size Classification

Minards Pond is a 47.5 acre impoundment. The maximum potential storage volume of the dam is 826 acre-feet. The height of the dam is approximately 25 feet. The Army Corps of Engineers recommends that dams with a storage potential of greater than 50 acre-feet but less than 1000 acre-feet or a height of greater than 25 feet but less than 40 feet be classified as small. In the case of Minards Pond dam storage volume governs and the dam is classified as small.

d. Hazard Classification

A failure of the Minards Pond Dam would send a flood wave into the downstream natural channel which runs through a sparsely populated area north of Bellows Falls. A single-family wood frame residence, located approximately 1,600 feet downstream would be damaged by the flood wave with possible resultant loss of life. Approximately 3,600 feet downstream, the natural channel passes under U.S. Highway 5 through a 48" box culvert. The culvert is much too small to pass the flood flow and major damage to the highway would result.

In consideration of the above, the hazard category is rated as significant.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
MINARDS POND DAM

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Dufresne-Henry Engineering Corporation, located in North Springfield, Vermont has been retained by the New England Division to inspect and report on selected dams in the State of Vermont. Authorization and notice to proceed were issued to Dufresne-Henry Engineering Corp. under a letter of May 26, 1978 from Ralph I. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0341 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of nonfederal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by nonfederal interests.

(2) Encourage and prepare the states to initiate quickly effective dam safety programs for nonfederal dams.

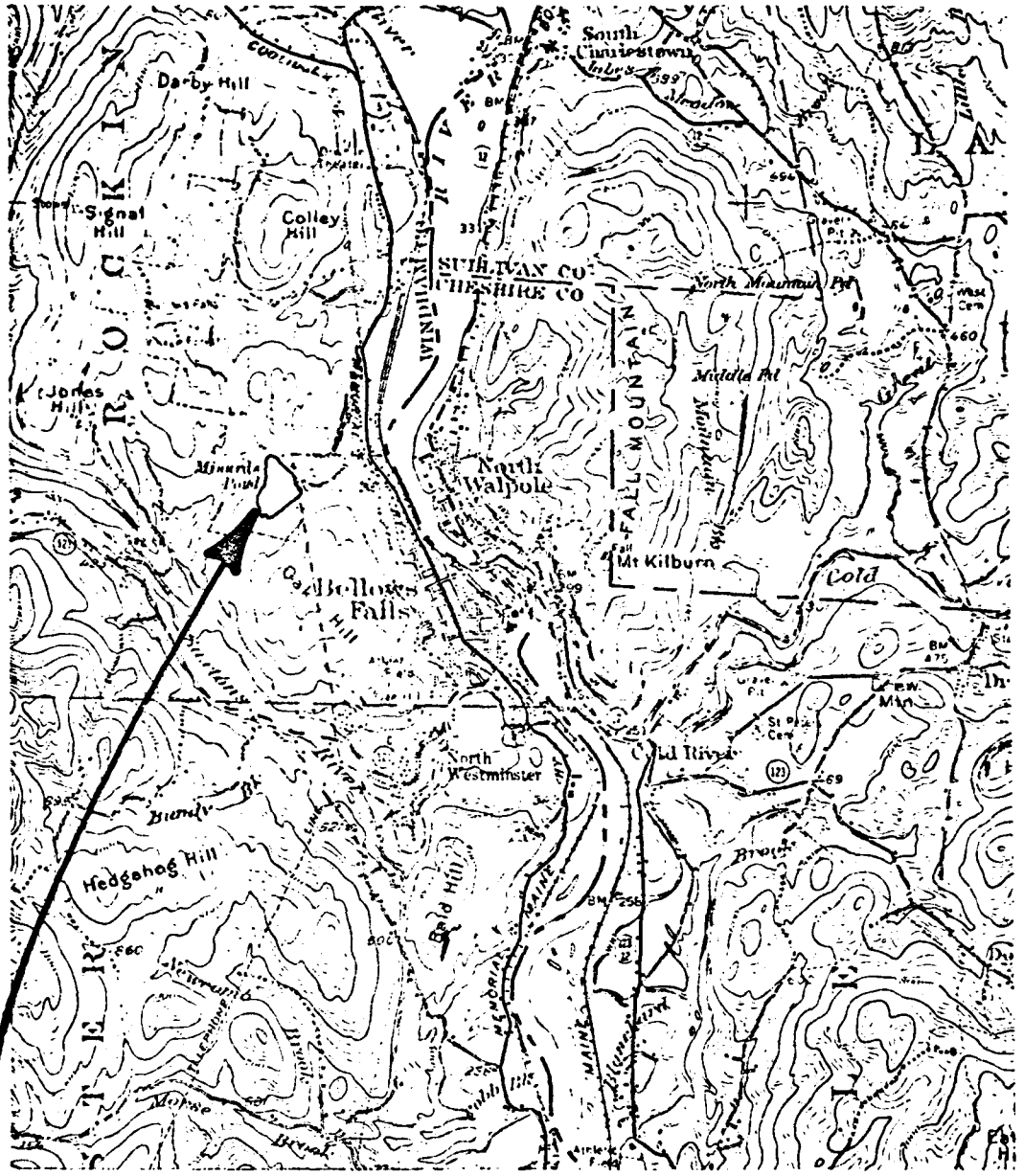
(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

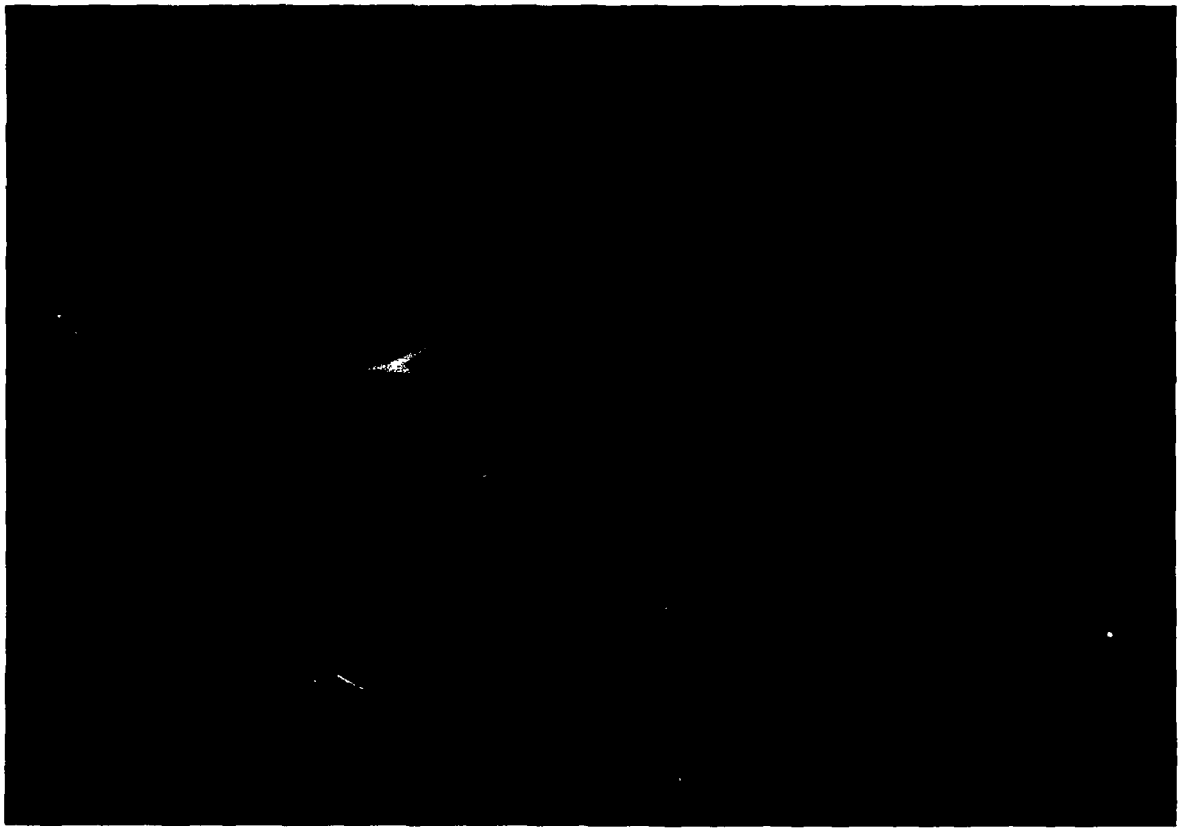
Minards Pond is located in the Village of Bellows Falls, Town of Rockingham, Windham County, Vermont.

The site is located on an unnamed tributary of the Connecticut River and is approximately 4,100 feet from the confluence of the two water courses.



SOURCE OF MAP:
U.S. GEOLOGICAL SURVEY
BELLOWS FALLS, VT-NH
SCALE: 1"=1 MILE

CLIENT NO	22-0558	DUFRESNE-HENRY ENGINEERING CORP.	
ENGINEER	MRP	LOCATION MAP MINARD'S POND DAM	
DRAWN BY	RB		
DATE	JULY 1978	ROCKINGHAM VERMONT	A 6000



MINARD'S POND DAM
ROCKINGHAM, , VERMONT

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The only operational procedure is that of diverting a portion of the flow from two brooks in another watershed into Minards Pond during periods of low flow within the watershed of Minards Pond.

4.2 Maintenance of Dam

The grass on the crest of the dam and part way down the downstream slope is usually mowed annually.

4.3 Maintenance of Operating Facilities

The gate house receives periodic inspection and necessary maintenance to maintain the facility in operating condition.

The outlet structure has a substantial build-up of debris located in front of the trash racks and outlet pipe.

4.4 Description of Any Warning System in Effect

There is no warning system in effect.

4.5 Evaluation

The mowing of the grass on the crest of the dam is the proper maintenance, but this procedure should be extended to include the cutting of the brush on the downstream face of the dam to insure that large trees will not again grow on this embankment.

Subsequent to the inspection of June 21, 1978 the brush and shrubs on the downstream face of the dam were cut and removed.

The debris located in front of the outlet conduit and trash racks should be removed regularly to minimize the possibility of clogging.

SECTION 5: HYDRAULIC AND HYDROLOGIC EVALUATION

5.1 Evaluation of Features

a. Design Data

There are no hydraulic or hydrologic design data available.

b. Experience Data

No records, accounts, or recollections of flooding at the dam site exist.

c. Visual Observations

No inflow channel exists; the main source of water to the reservoir is ground water. Water derived from Ellis Brook and Farr Brook is diverted into the reservoir via valved pipelines only during dry periods or periods of excessive water consumption by the Village.

No emergency spillway and no outlet for draining the pond is available.

d. Overtopping Potential

Analysis of the overtopping potential at Minards Pond was based on the assumption that the overflow structure would be completely blocked and inoperable, that no flow would be drawn off by the Village water supply line, and that the valves from Farr and Ellis Brooks are closed. This would be the most severe case, and the pond would have to store the total inflow of a test flood, or overtop.

The analysis was performed by making use of the HEC-1 computer program, to compute the expected rainfall and inflow to the pond. The results of the HEC-1 analysis can be found in Appendix D.

The analysis showed that on the basis of no outflow from the reservoir, a test flood (1/2 the probable maximum flood) would just reach the top of the dam. If the flows from Farr and Ellis Brooks are included, the dam would be overtopped by the test flood.

The wave that would be generated by failure of this dam would be roughly 16 feet high.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The following observations indicate that the downstream slope at the highest part of this dam may be only marginally stable:

(1) The crest of the dam apparently was raised vertically in the 1930s about 3 feet, without widening the base of the dam.

(2) The reservoir level is allowed to rise to within 3.5 feet from the present top of the dam, which means it is at the level of the top of the original dam.

(3) The downstream slope is relatively steep, about 1.2H:1V.

(4) In approximately 1974, exposed soil scarps apparently were observed. At present one can see berm-like features on the lower parts of the downstream slope, which may have been constructed for stability or may have been the result of slope movement.

The presence of many large stumps that are rotting within the downstream slope, as well as animal holes, makes it increasingly likely that a path of seepage, i.e., piping, may develop at some time. If such a process starts, and if the soil of which the dam is composed does not "self-filter", the dam would be subject to washout.

There is a 1.5 foot deep by 70 foot long low zone in the crest near the left abutment which was apparently an unintentional result of the last raising of the dam. If the pond level were to reach the elevation of this low zone, overflow would start at this location. Since the low zone is not riprapped, it would erode and possibly wash out the dam.

At the time of inspection there was substantial seepage at the downstream toe from points, at most, 2 feet above the toe line. This seepage was clear, and therefore seems to pose no immediate hazard. However, the cause, i.e., the path of this seepage, is not known. Therefore one cannot judge what effects this seepage may have on the dam in the future.

b. Design and Construction Data

See 6.1.a. above. There are no design data available pertaining to the original construction.

c. Operating Records

Records pertaining to the operation of this facility do not exist.

d. Post-Construction Changes

The effects of known post-construction changes were discussed in 6.1.a. above.

e. Seismic Stability

This dam is in Seismic Zone 2, and, in accordance with recommended Phase I guidelines, does not warrant a seismic analysis.

SECTION 7: ASSESSMENT, RECOMMENDATIONS/ REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual inspection and known history indicate that the dam is in poor condition. The major concerns about the integrity of this dam are:

(1) There is no means available to lower the reservoir in the event of emergency.

(2) The downstream slope is steep and apparently sloughed in about 1974.

(3) The dam crest was raised about 3 feet some time after 1939, without widening the base, and the reservoir was allowed to rise approximately to the level of the crest of the original dam.

(4) There is no spillway. A low, grassed zone on the crest, about 1.5 feet deep and 70 feet wide, will act as an unintentional spillway. Any significant flow over this zone is likely to cause a washout.

(5) Rotting stumps of many large trees and several animal holes are on the downstream slope. These continuously increase the likelihood that internal erosion will occur.

b. Adequacy of Information

The assessment of this dam was based primarily on visual observations and, in part, on verbal information provided by people who have observed the dam in the past.

Based on Phase I hydrological calculations an unusual number of events would have to occur before Minards Pond would pose a threat from overtopping.

c. Urgency

The recommendations given in Section 7.2 should be carried out within twelve months after receipt of this report.

d. Need for Additional Investigation

The recommendations given in Section 7.2 should be carried out.

7.2 Recommendations

An engineer qualified in the design of dams should be engaged to:

a. Analyze the stability of the downstream slope and make necessary recommendations for reconstruction. This analysis must be preceded by borings to determine the composition of the dam and the permeability of the materials, measurement of the water levels in the dam, and a program of seepage monitoring.

b. Design and construct a large-capacity emergency drawdown structure.

c. Design and construct an emergency spillway.

d. Develop appropriate techniques for removing the large, rotting tree roots from the downstream slope without endangering the dam.

e. Evaluate the effects of the animal holes and make recommendations to ensure that the dam is not endangered by their presence.

7.3 Remedial Measures

a. Alternatives

Not applicable.

b. Operating and Maintenance Procedures

(1) Establish a flood warning system.

(2) Make an annual maintenance inspection which should include operation of all operating equipment such as the conrol house gate.

(3) Make an annual technical inspection.

(4) Reshape the crest of the dam to eliminate low spots and eroded zones.

(5) Repair the riprap on the upstream face.

(6) Cut vegetation on all slopes and to a distance about 20 feet downstream annually, or more often, as needed.

(7) Clean debris and overhanging trees from the outlet structure and the outlet channel.

(8) The pond level must not be allowed to rise above elevation 612.7 until the recommendations in Section 7.2 have been carried out.

(9) Repair areas of cracked or spalled concrete on all appurtenant structures. Particular attention should be given to making a permanent repair on the gate house foundation and to repairing the concrete on the discharge conduit headwall.

(10) Take remedial measures to repair the erosion occurring downstream of the discharge conduit.

APPENDIX A

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT MINARDS POND DAM

DATE June 21, 1978

TIME 10:00

WEATHER Clear, hot, 82° in shade
Humidity about 60%, 2-5 mph

W.S. ELEV. ____ U.S. ____ DN.S.

PARTY:

1. Walter A. Henry	D-H	6.	
2. M. R. Peloso	D-H	7.	
3. F. J. Forcier	D-H	8.	
4. E. J. Slavin	D-H	9.	
5. S. J. Poulos	GEI	10.	

PROJECT FEATURE	INSPECTED BY	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE _____ NAME _____

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	615.6 MSL
Current Pool Elevation	612.7 MSL
Maximum Impoundment to Date	51 Acres.
Surface Cracks	None observed.
Pavement Condition	No pavement. Grassed surface.
Movement or Settlement of Crest	Left side is low over a distance of 70 feet from abutment. Low spot in crest opposite outlet works. Low spots on upstream side of crest at 80 and 105 feet left of outlet at right abutment.
Lateral Movement	Not discernible.
Vertical Alignment	In most locations, crest slopes a few tenths of a foot downstream.
Horizontal Alignment	Arched upstream. Not able to see any misalignment.
Condition at Abutment and at Concrete Structures	Near left abutment downstream seepage collected in 8-inch pipe that has been filled over. Pipe was installed to collect seep that existed. Small seep now through pipe. Mr. Thomas indicated that seepage stops when reservoir is below El. 17. At right abutment, seepage at downstream contact line all the way down to valley bottom. 2 feet upslope.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Free access. Some animal holes. Locked entrance to site.
Sloughing or Erosion of Slopes or Abutments	Eroded zone on downstream slope, 12 feet left of outlet works, due to low spot on crest. "Berm" downstream between locations of the two cross sections. May be old slough. A second "berm" feature appears about 60 feet left of left cross section.

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE NAME

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Rock Slope Protection - Riprap Failures	Riprap slightly wavecut at lake surface level. Looks good underwater.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	Seepage starts at right abutment contact and causes mushy zone at toe and 2 feet up slope to a point 15 feet left of service bridge. Streamlets at: (1) outlet of plugged level control weir (trickle), (2) 23 feet right of (1) at 2-3 gpm, (3) 54 feet right of (1) which appears to be collected water from seeps at right abutment contact.
Piping or Boils	None observed.
Foundation Drainage Features	None evident.
Toe Drains	None evident.
Instrumentation System	None evident.
Vegetation	Numerous very large stumps on downstream face. Grass and shrubs on all surfaces.

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE _____ NAME _____

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	No dikes
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Sloughing or Erosion on Slopes or Abutments	
Trespassing on Slopes	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM **DATE** June 21, 1978

PROJECT FEATURE _____ **NAME** M. R. Peloso

DISCIPLINE Geotechnical **NAME** S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Under water.
Bottom Conditions	Under water.
Rock Slides or Falls	N.A.
Log Boom	None.
Debris	Cannot see. Under water.
Condition of Concrete Lining	N.A.
Drains or Weep Holes	N.A.
b. Intake Structure	
Condition of Concrete	Under water.
Stop Logs and Slots	N.A.
	Note: The gatehouse which serves as the intake structure for the Bellows Falls water system is the only conduit which has a gate on it which is left open all the time. The foundation has a crack which was repaired.

PERIODIC INSPECTION CHECK LIST

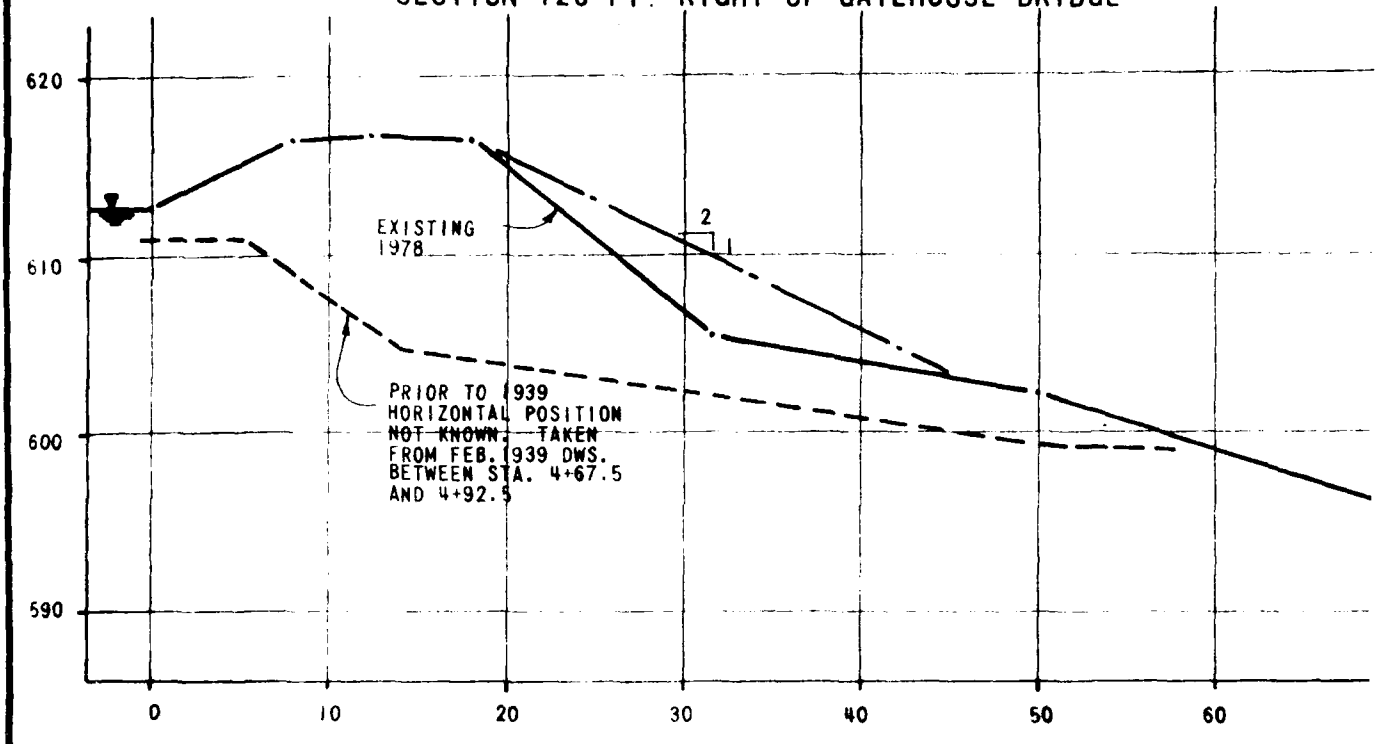
PROJECT MINARDS POND DAM **DATE** June 21, 1978

PROJECT FEATURE _____ **NAME** M. R. Peloso

DISCIPLINE Geotechnical **NAME** S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	No geotechnical features.
General Condition	Good.
Condition of Joints	None.
Spalling	None.
Visible Reinforcing	Some reinforcing exposed on roof slab - not a structural member.
Rusting or Staining of Concrete	None apparent.
Any Seepage or Efflorescence	None
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	None.
Cracks	None.
Rusting or Corrosion of Steel	Some on Trash Rack.
b. Mechanical and Electrical	
Air Vents	N/A
Float Wells	N/A
Crane Hoist	N/A
Elevator	N/A
Hydraulic System	N/A
Service Gates	N/A
Emergency Gates	N/A
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System	N/A

SECTION 120 FT. RIGHT OF GATEHOUSE BRIDGE



SCALE IN FT. (1"=10')

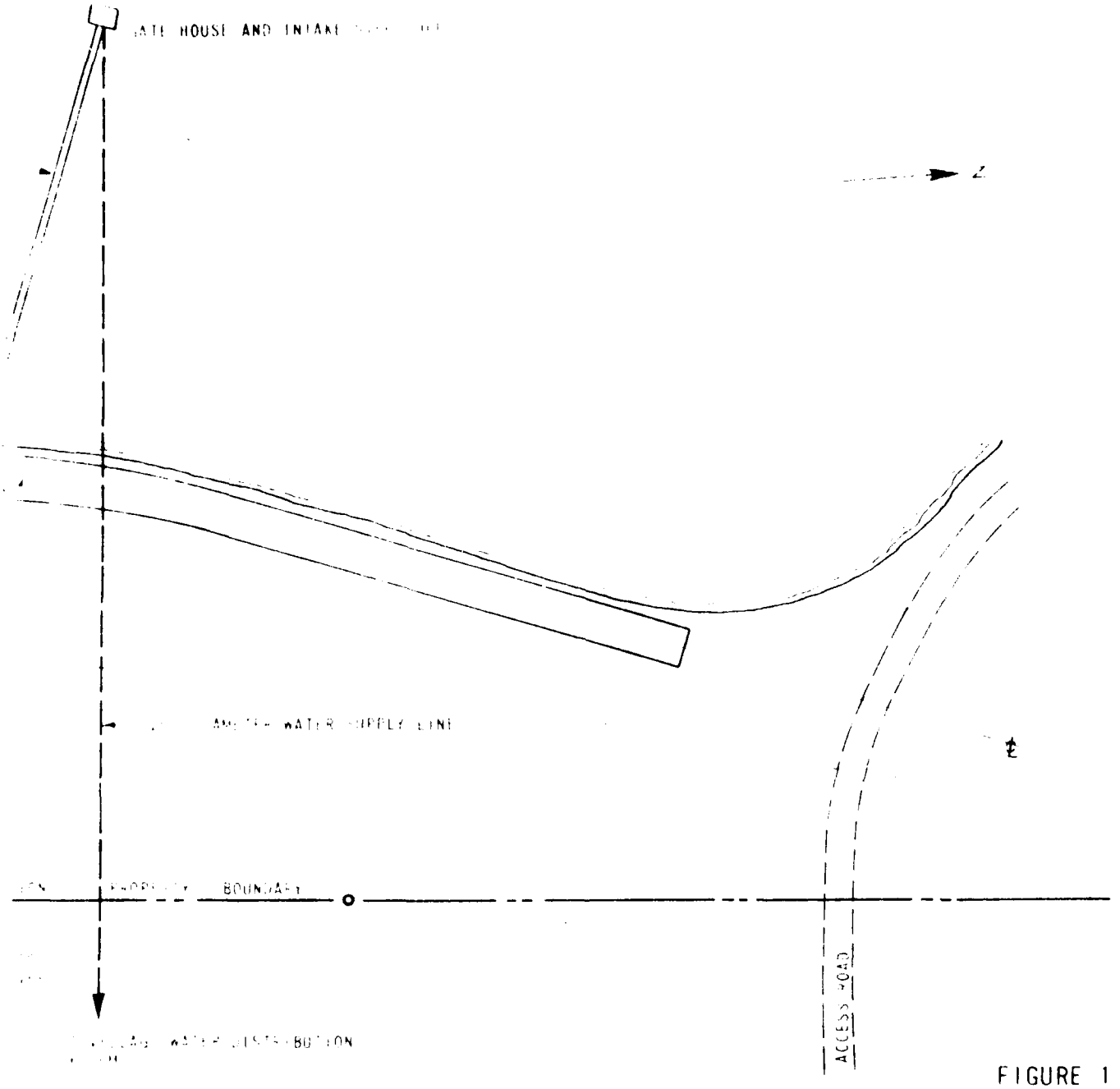


FIGURE 1

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PLAN OF

MINARD'S POND DAM

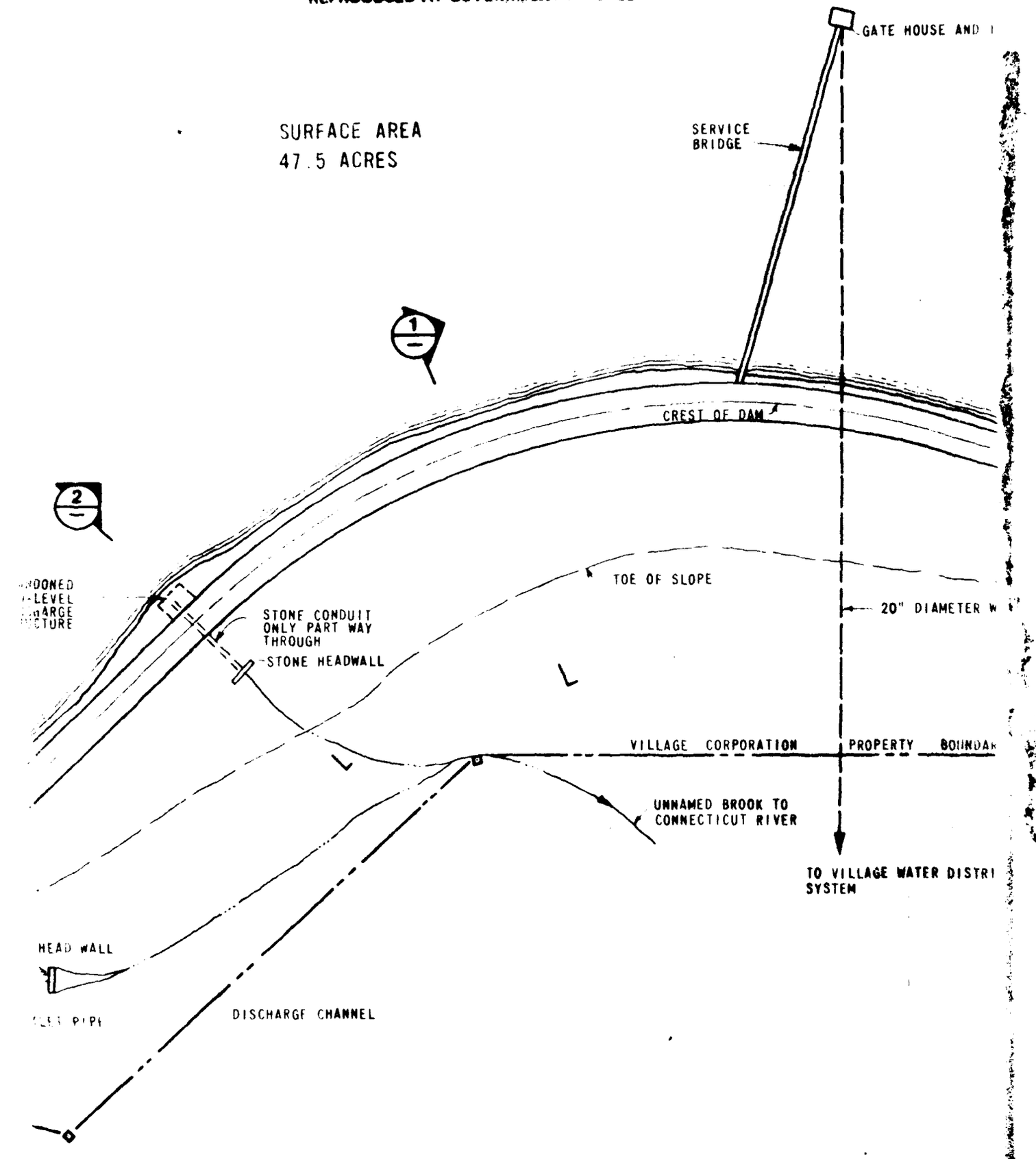
VILLAGE OF BELLOWS FALLS

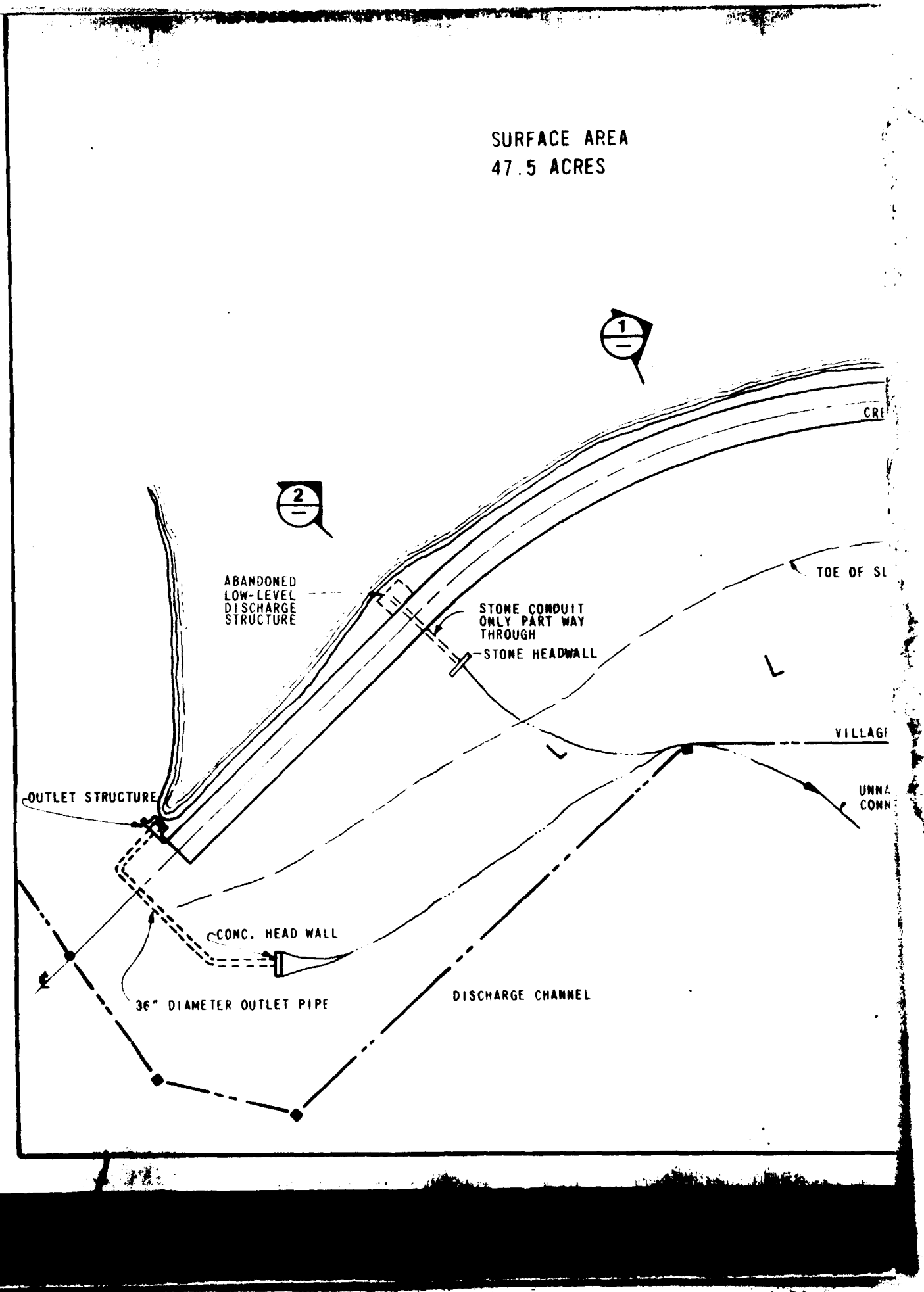
[illegible] INGHAM VERMONT

DRAWN			SCALE 1" = 50'
[illegible]			DATE JULY 1978

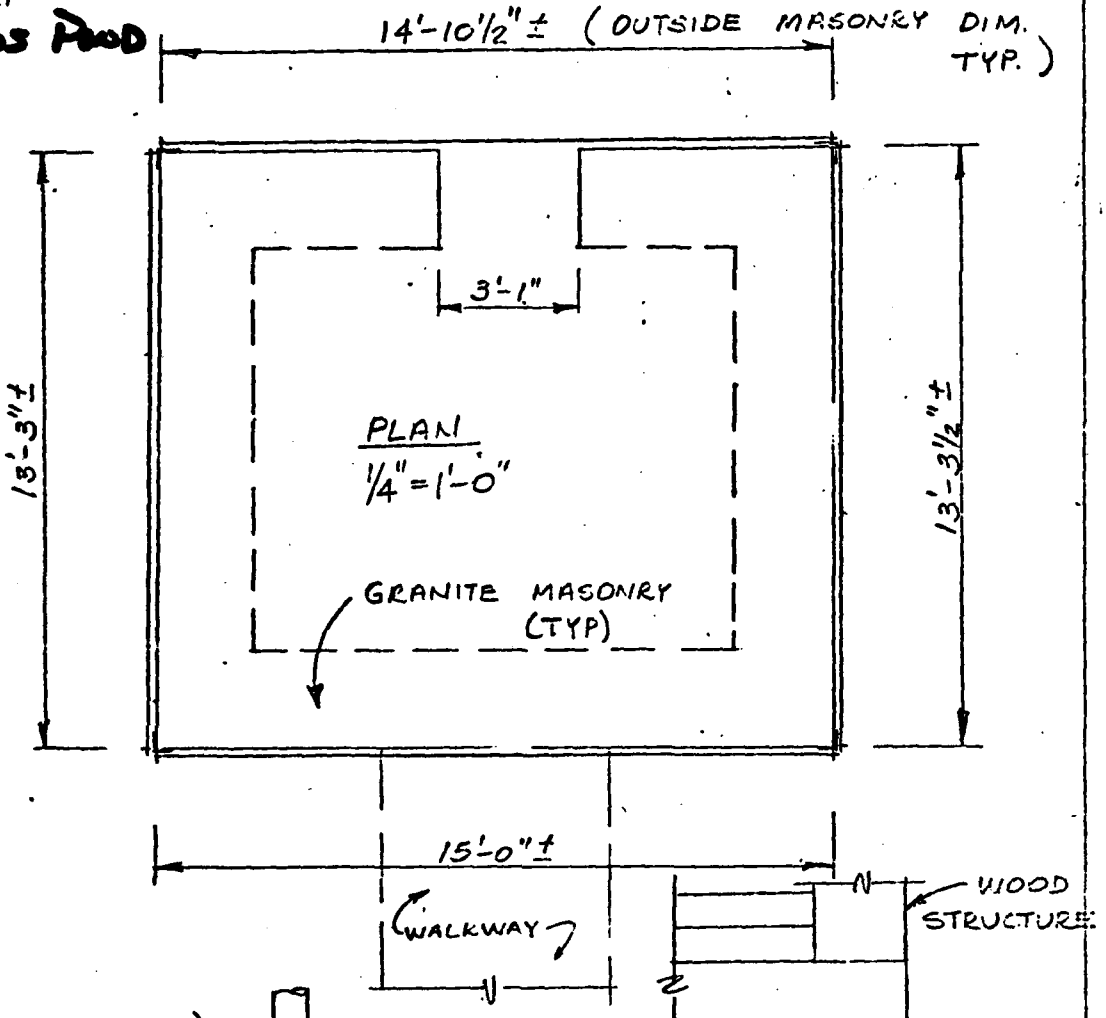
R 6199

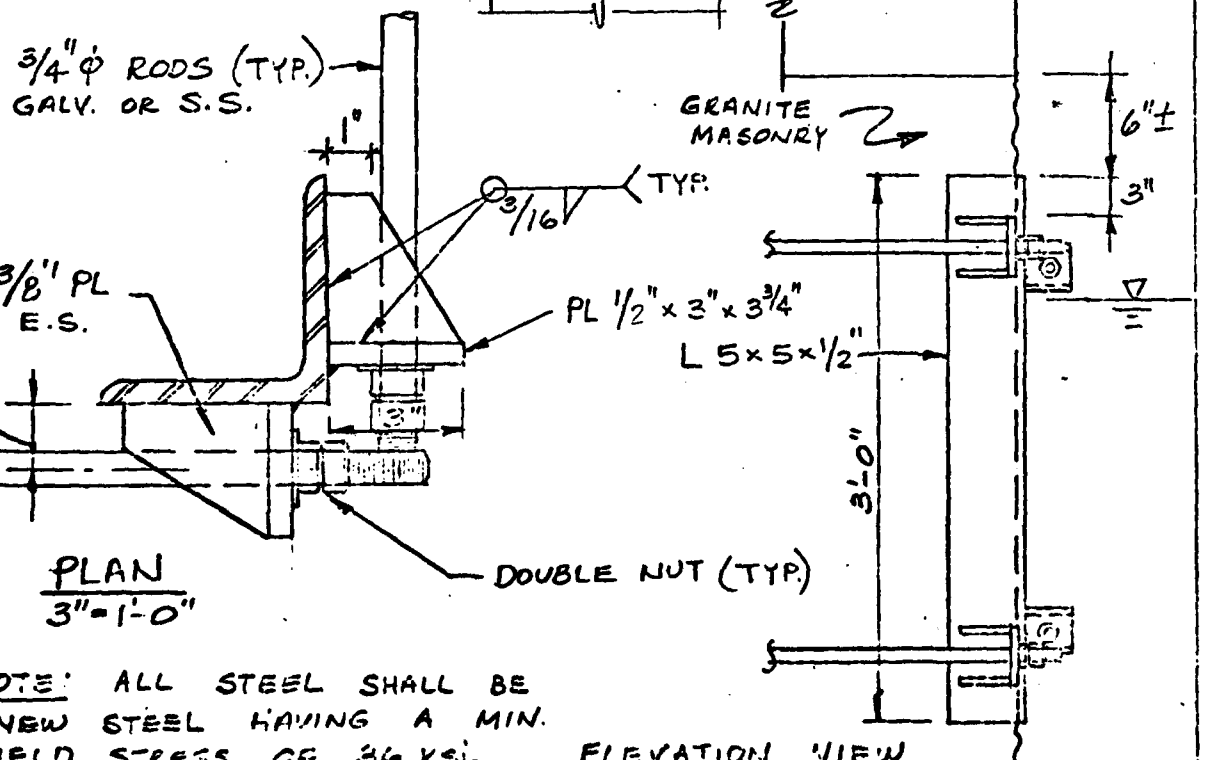
3


SURFACE AREA
47.5 ACRES
GATE HOUSE AND
SERVICE BRIDGE
1
CREST OF DAM
2
TOE OF SLOPE
20" DIAMETER W
STONE CONDUIT ONLY PART WAY THROUGH
STONE HEADWALL
VILLAGE CORPORATION
PROPERTY BOUNDA
UNNAMED BROOK TO CONNECTICUT RIVER
TO VILLAGE WATER DISTRI SYSTEM
HEAD WALL
DISCHARGE CHANNEL


SURFACE AREA
47.5 ACRES
1
2
CRE
TOE OF SL
ABANDONED
LOW-LEVEL
DISCHARGE
STRUCTURE
STONE CONDUIT
ONLY PART WAY
THROUGH
STONE HEADWALL
VILLAGE
OUTLET STRUCTURE
UNNA
CONN
CONC. HEAD WALL
36" DIAMETER OUTLET PIPE
DISCHARGE CHANNEL

MINARDS POND





PLAN
3" = 1'-0"

ELEVATION VIEW
1" = 1'-0"

NOTE: ALL STEEL SHALL BE NEW STEEL HAVING A MIN. YIELD STRESS OF 36 KSI. ALL ASSEMBLIES TO BE GALVANIZED AFTER FABRICATION.

EXHIBIT E

The undersigned representatives of the U.S. Army Corps of Engineers, New England Division visually inspected the Minards Pond Dam on 19 July 1973 between the hours of 1100, and 1200. On the basis of visual observations, the following comments are made:

No apparent or reported damage to dam from recent floods.

CF:
(Town Official): Mr. D. Thomas, President Village of Bellows Falls
Vt. Water Resources Board
Coordinator, COE
Dam Inspection Team
Mr. E. P. Gould

Location: Town of Village of Bellows Falls, County of Windham, State of Vermont
Stream: No stream
Map Coords.:
Other: 2 miles northwest of Town Hall

Owner: Village of Bellows Falls
Function of Dam: Water Supply

EXHIBIT D

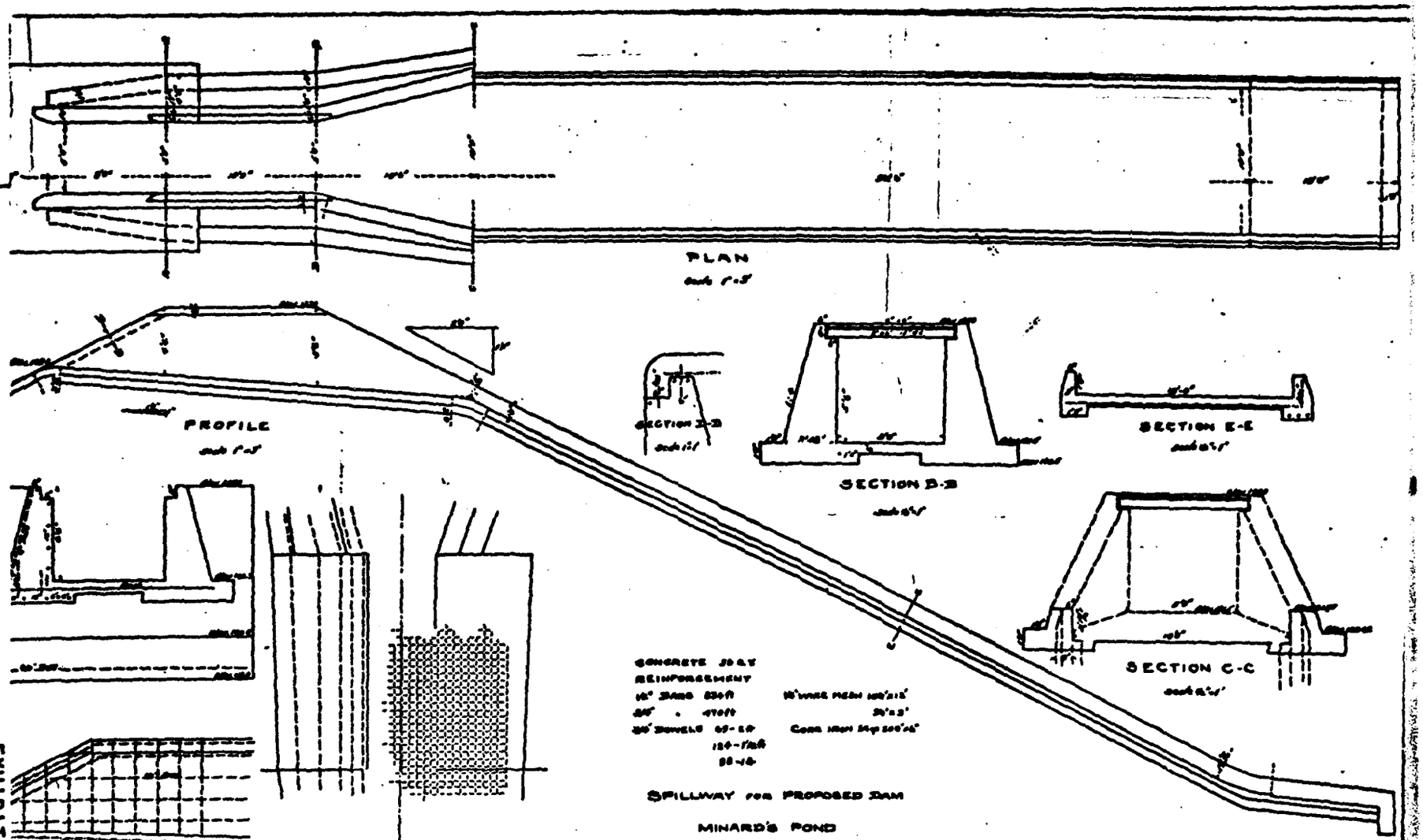

PLAN
PROFILE
SECTION B-B
SECTION E-E
SECTION C-C
SECTION A-A
TYPICAL REINFORCEMENT
CONCRETE 3000 P.S.I.
REINFORCEMENT
SPILLWAY FOR PROPOSED DAM
MINARD'S POND
WATER DEPARTMENT
VILLAGE CORPORATION
BELLOWS FALLS, VT

EXHIBIT C

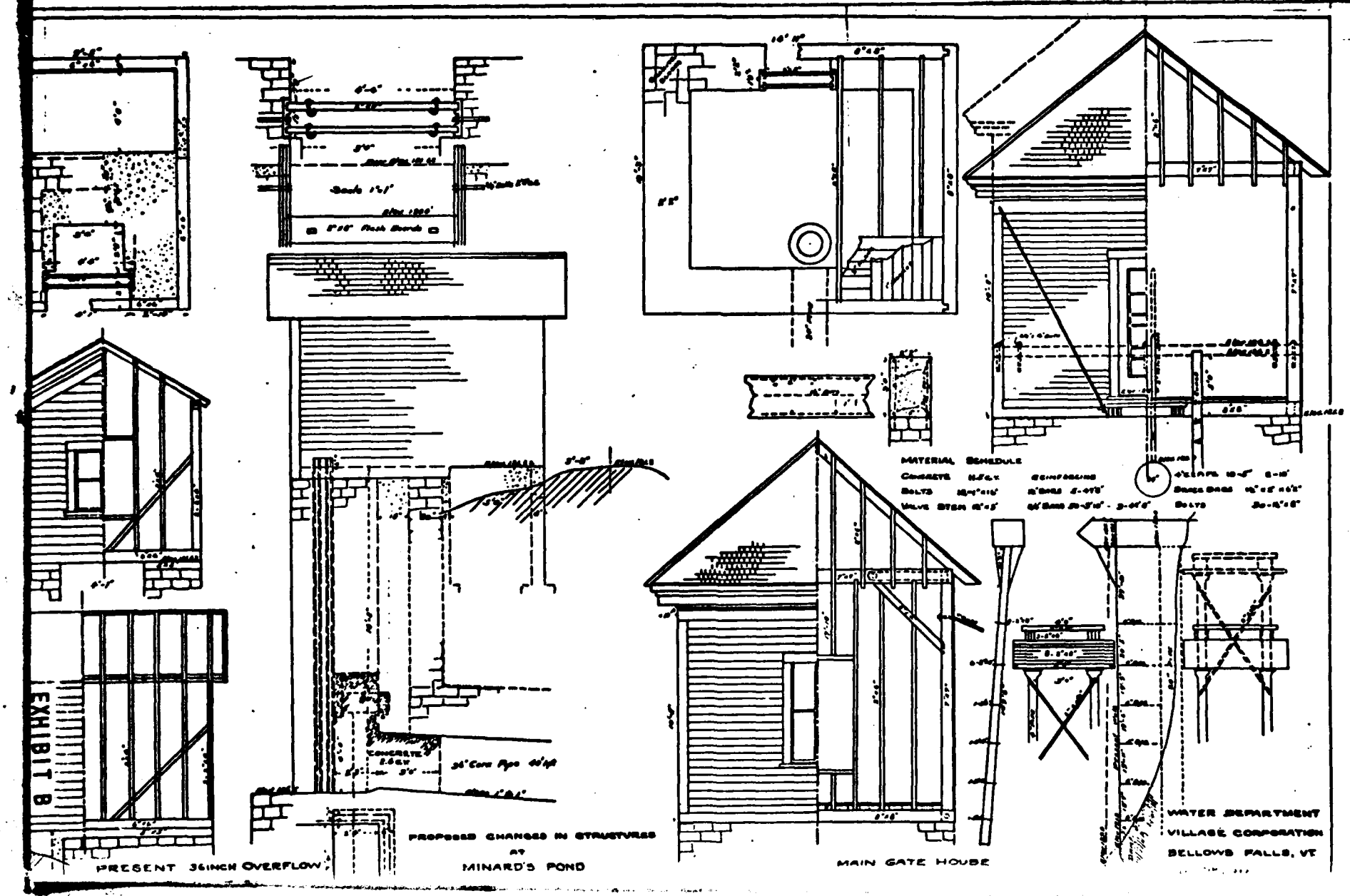
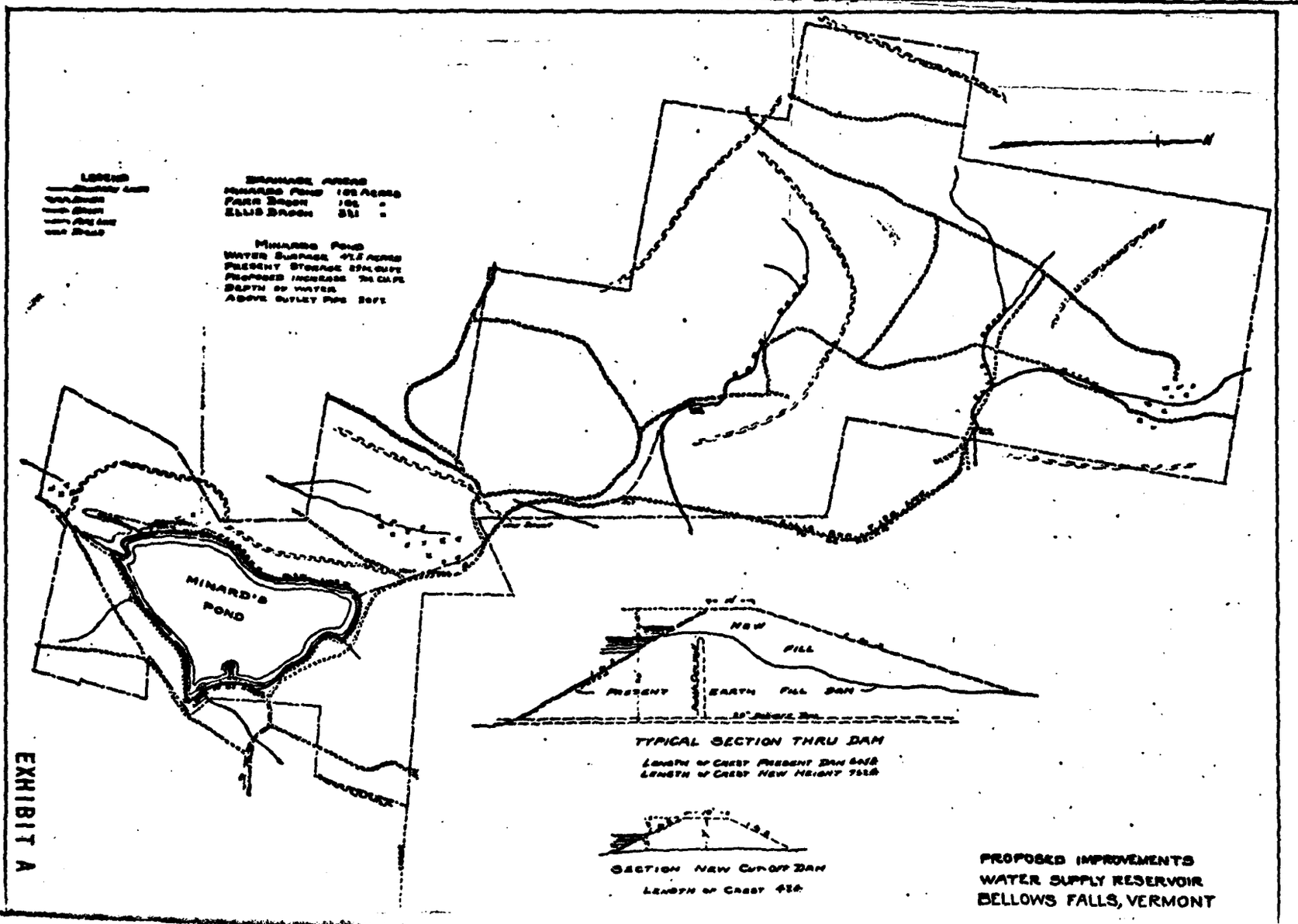


EXHIBIT B
PRESENT 36INCH OVERFLOW
PROPOSED CHANGES IN STRUCTURES
AT
MINARD'S POND
MAIN GATE HOUSE
MATERIAL SCHEDULE
WATER DEPARTMENT
VILLAGE CORPORATION
BELLOWS FALLS, VT


MINARD'S POND
NEW FILL
PRESENT EARTH FILL DAM
TYPICAL SECTION THRU DAM
SECTION NEW CUT-OFF DAM
PROPOSED IMPROVEMENTS
WATER SUPPLY RESERVOIR
BELLOWS FALLS, VERMONT
EXHIBIT A

APPENDIX B

Exhibit A, B, C - Plans of Proposed Improvements Water Supply Reservoir "prepared 1939" shows section of original earth fill dam. Original plans on file at Village Manager's office.

Exhibit D - Corps of Engineers Inspection report of Minards Pond after flood of July 1973.

Exhibit E - Details of repairs to gate house foundation.

Also available from the Village of Bellows Falls are cross sections of the dam showing the proposed 1939 reconstruction.

Figure 1 - Plan of Minards Pond Dam.

Figure 2 - Sections of dam embankment.

Figure 3 - Profile along centerline of dam.

Figure 4 - Detail overflow outlet.

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE _____ NAME M. R. Peloso

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	Good.
Anchor Bolts	Good.
Bridge Seat	Good.
Longitudinal Members	Good.
Under Side of Deck	Good.
Secondary Bracing	Good.
Deck	Good.
Drainage System	2 x 6 spaced planking
Railings	None.
Expansion Joints	None.
Paint	Wood preservative.
b. Abutment & Piers	
General Condition of Concrete	N/A
Alignment of Abutment	N/A
Approach to Bridge	Grassed and from top of dam.
Condition of Seat & Backwall	N/A
	Note: Bridge has recently been reconstructed.

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE NAME M. R. Peloso

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	There is no spillway on this dam except for a small weir at right abutment and a 70-foot long low zone near left abutment. Comments below refer to this low zone, because it will act as spillway.
a. Approach Channel	
General Condition	Approach channel for weir at right abutment has stone training walls, 18" high.
Loose Rocks Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Underwater.
b. Weir and Training Walls	
General Condition of Ground	Grassed surface of dam subject to erosion and washout if overtopping occurs.
Rust or Staining	N/A
Spalling	N/A
Any Visible Reinforcing	N/A
Any Seepage or Efflorescence	N/A
Drain Holes	N/A
c. Discharge Channel	
General Condition	Fair.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Channel	Grass, shrubs and stumps.
Other Obstructions	None.

PERIODIC INSPECTION CHECK LIST

PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE NAME M. R. Peloso

DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	One outlet is the valving system for feeding the Bellows Falls water supply. The gate opens to pipes through dam that are completely buried. A second outlet formerly used to control water level, is now plugged. The old discharge structure is still visible downstream. At the right abutment there is now a level control weir that has no gate. The pond level is below the top of this weir. The notes below apply to outlet at right abutment.
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	None observed.
Channel	
Loose Rock or Trees Overhanging Channel	No rocks. Many trees overhang channel
Condition of Discharge Channel	It is fair. It is a 3-foot wide ditch cut in natural ground and has been eroded by past flow.

PERIODIC INSPECTION CHECK LIST

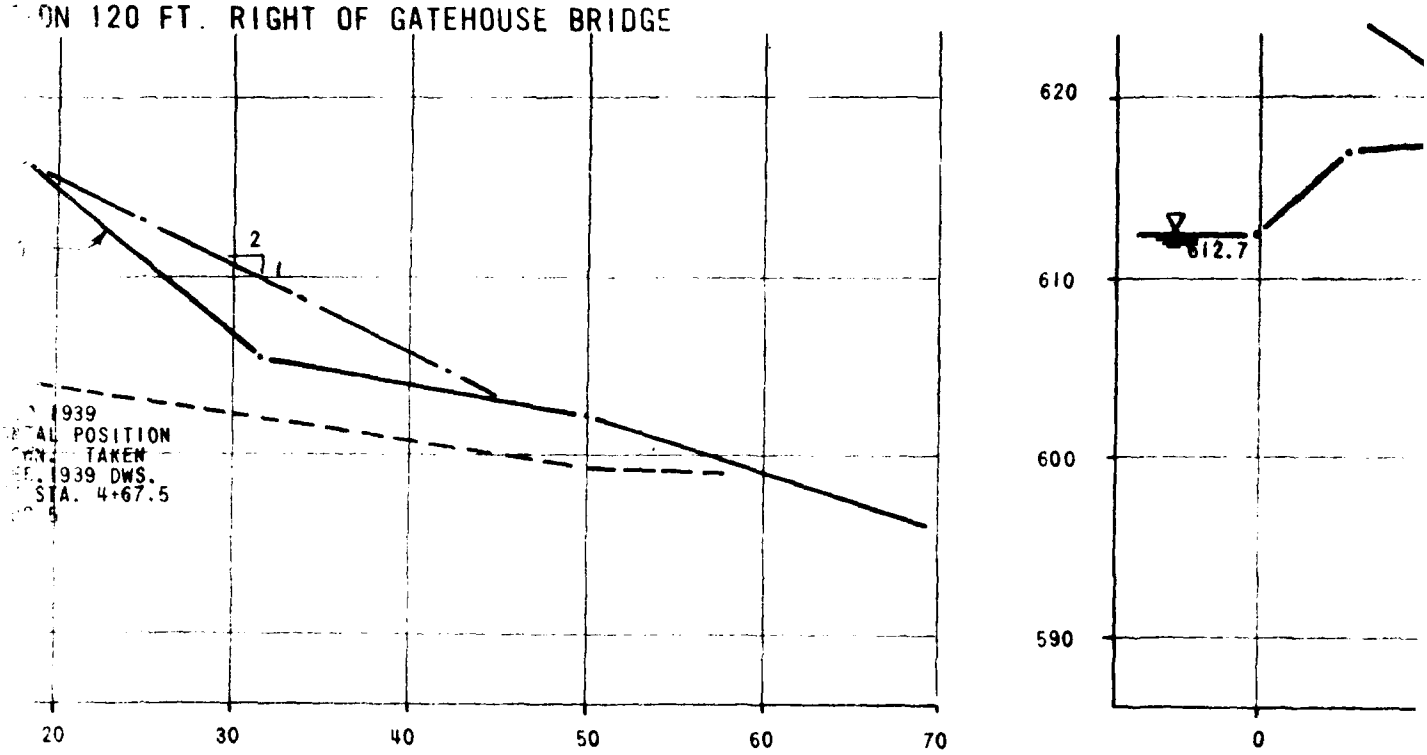
PROJECT MINARDS POND DAM DATE June 21, 1978

PROJECT FEATURE NAME M. R. Peloso

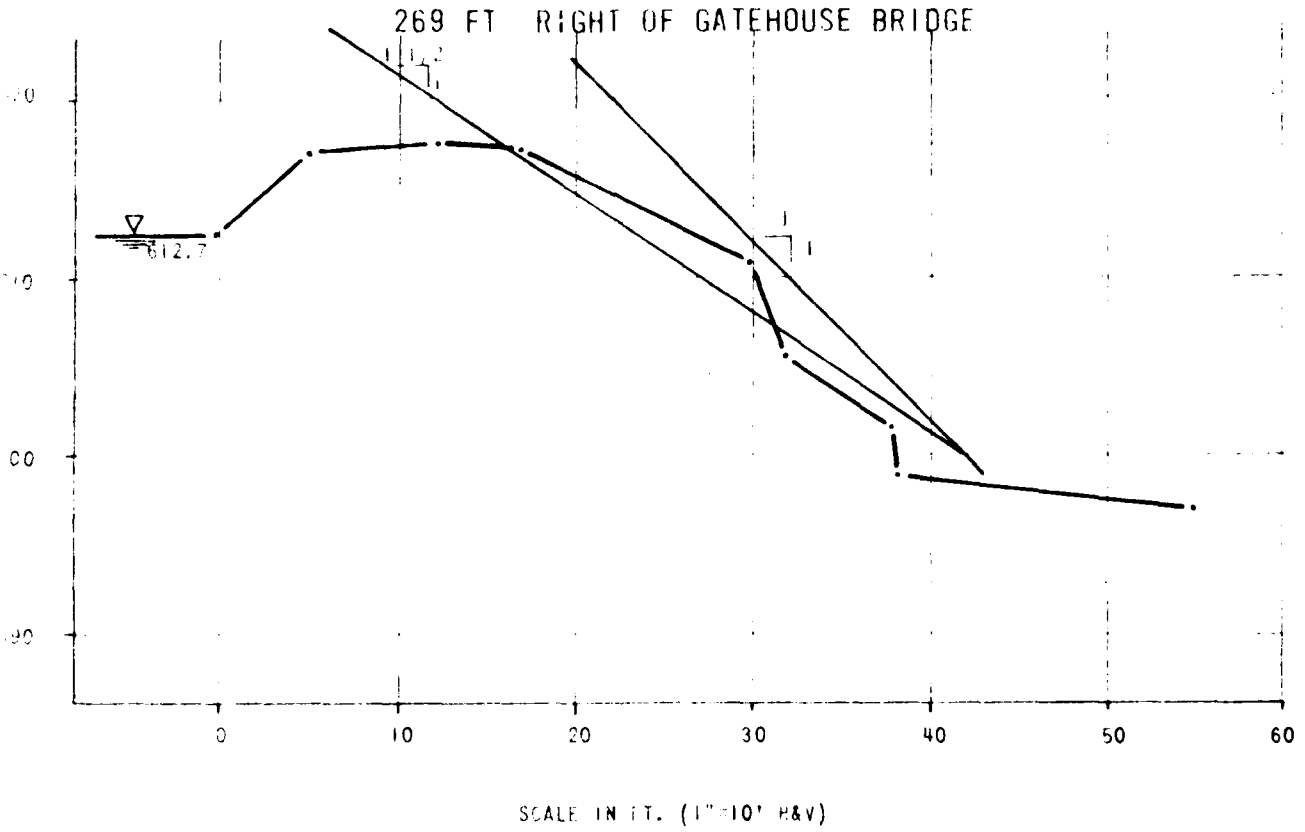
DISCIPLINE Geotechnical NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Good.
Rust or Staining on Concrete	None apparent.
Spalling	None.
Erosion or Cavitation	None.
Cracking	None.
Alignment of Monoliths	None.
Alignment of Joints	None.
Numbering of Monoliths	None.
	Note: (1) The transition is similar to a drop inlet with conduit. The 36" diameter appears to have changes in direction.
	(2) The lead wall on discharge end of conduit is cracked, misaligned and with no footing, erosion has taken place beneath it.

ON 120 FT. RIGHT OF GATEHOUSE BRIDGE



SCALE IN FT. (1"=10')



SCALE IN FT. (1"=10' H&V)

FIGURE 2

[illegible] ENGINEERING DEP. [illegible]	[illegible] ARMY ENGINEER DIV. NEW ENGLAND [illegible] WALTHAM, MA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

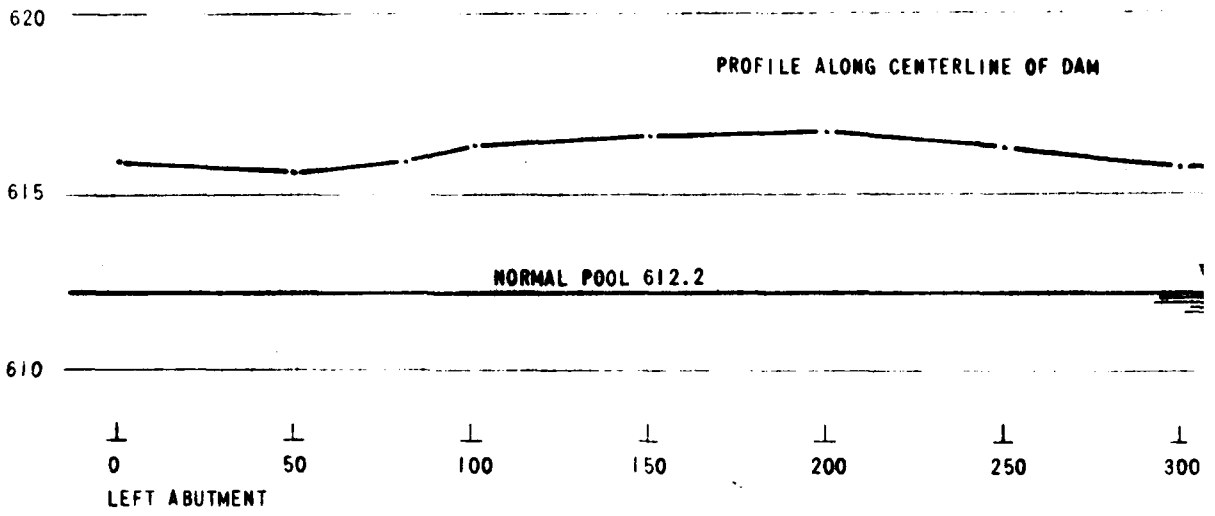
MINARD'S POND DAM
SECTION
BELLOWS FALLS VILLAGE CORP.

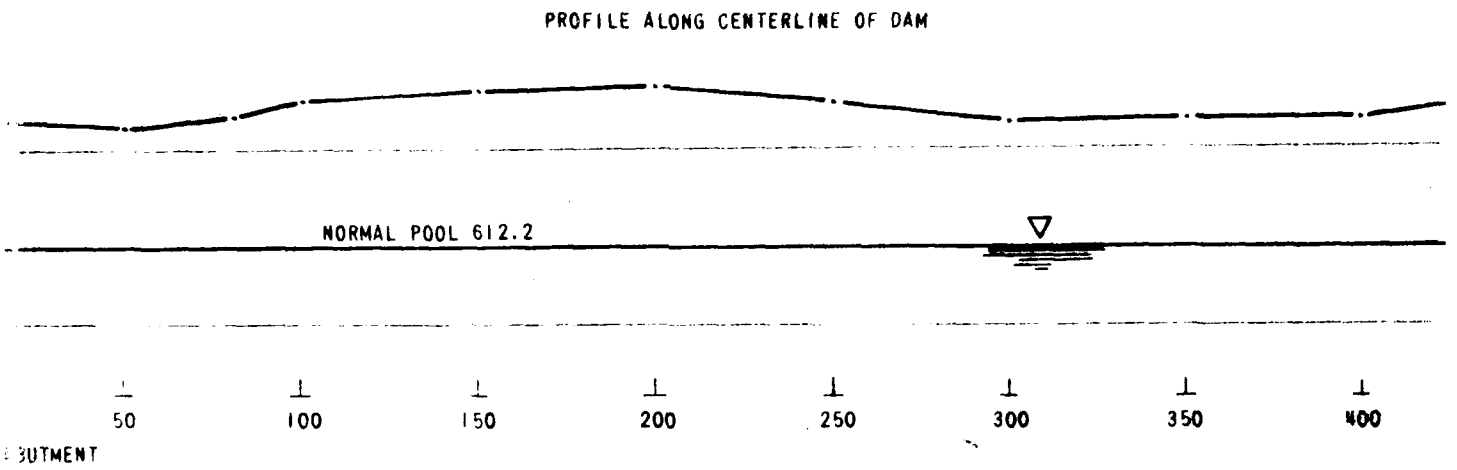
ROCKINGHAM VERMONT

DRAWN BY	RB		SCALE NONE
ENGR.	JRS		DATE JULY 1976

3

B 6200


620
PROFILE ALONG CENTERLINE OF DAM
615
NORMAL POOL 612.2
610
0
50
100
150
200
250
300
LEFT ABUTMENT


PROFILE ALONG CENTERLINE OF DAM
NORMAL POOL 612.2
50
100
150
200
250
300
350
400
BUTMENT

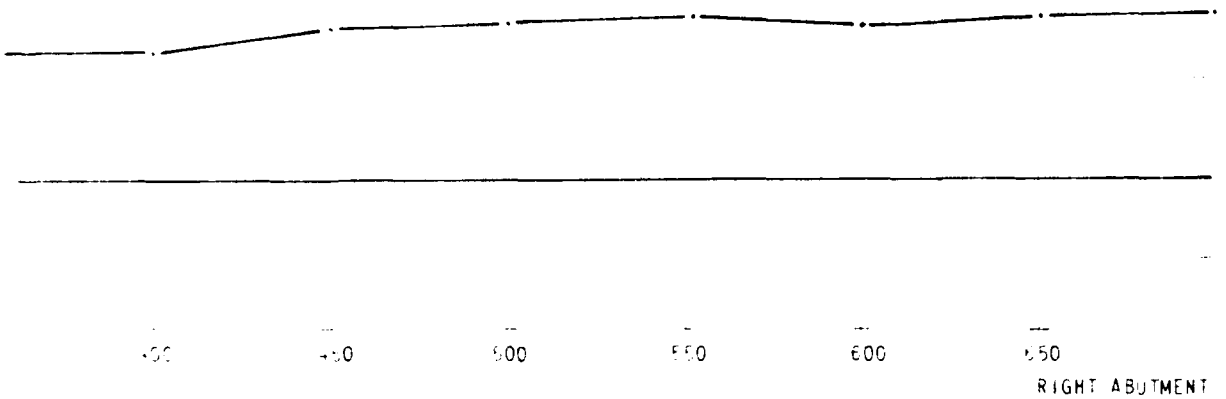


FIGURE 3

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

MINARD'S POND DAM

PROFILE ALONG ℄ OF DAM

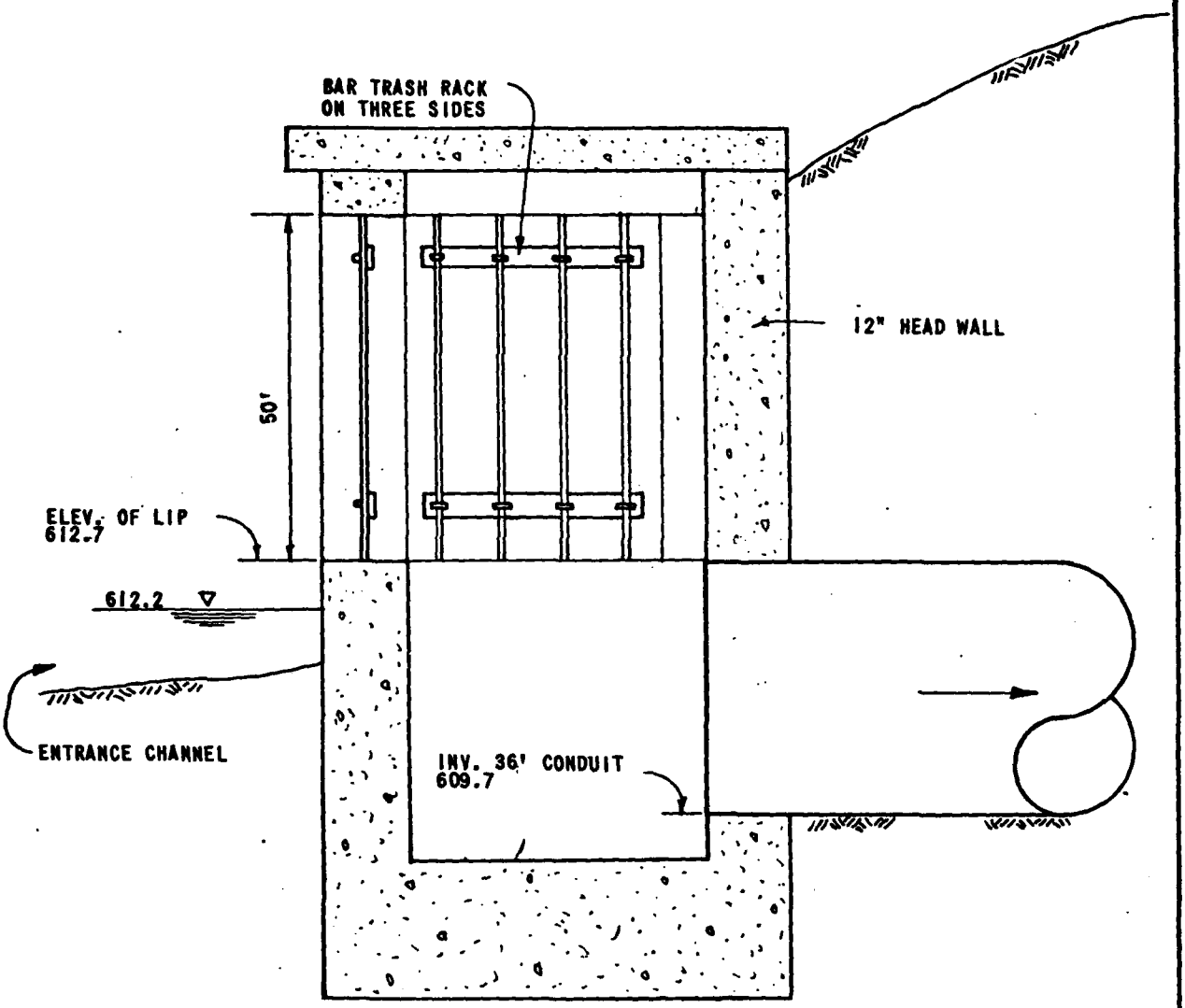
BELLOWS FALLS VILLAGE CORP.

ROCKINGHAM VERMONT

DRAWN	RB	SCALE	NONE
ENGR	EJS	DATE	JULY 1978

3

B 6201



DETAIL OVERFLOW OUTLET

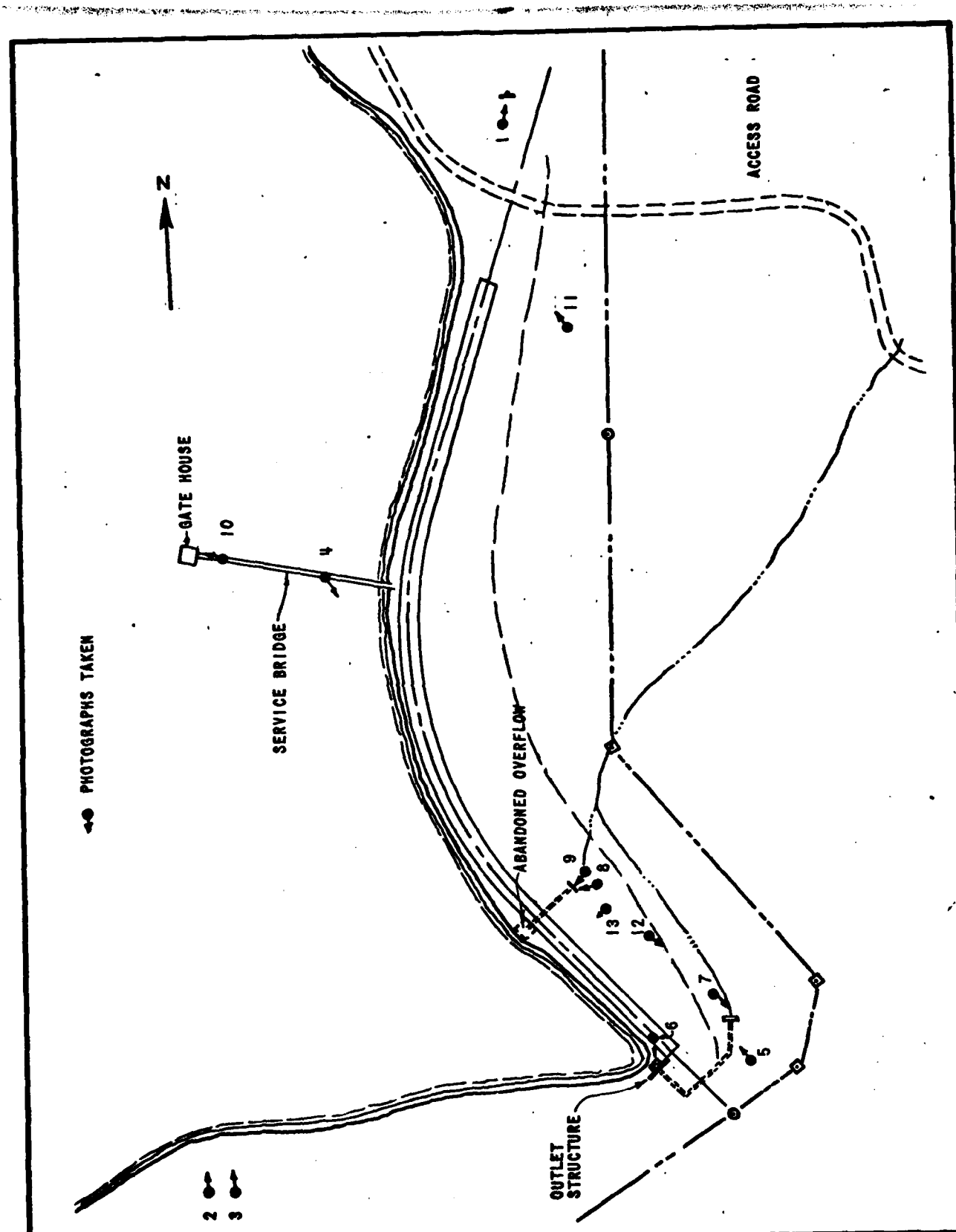
N.T.S.

CLIENT NO	22-0558	DUFRESNE-HENRY ENGINEERING CORP.	FIGURE 4
PROJ ENG	MRP	MINARD'S POND DAM	
DRAWN BY	RB		
DATE	JULY 1978	ROCKINGHAM VERMONT	A 6001

APPENDIX C

PHOTOGRAPHS

1. Identification sign at pond site.
2. View of dam from right side soon after completion of the original construction in the early 1800's.
3. Same view of dam from right side July 1978; note increased free board, service bridge gate house has been removed.
4. View of upstream face toward the right abutment from service bridge.
5. View of downstream face from right abutment.
6. Outlet structure located at right abutment.
7. 36" diameter outlet conduit with head wall and indication of downstream channel.
8. Head wall and downstream channel for abandoned stone masonry outlet conduit.
9. View looking into the abandoned conduit.
10. Crack in east face of gate house masonry foundation.
11. Outlet of drain constructed near left abutment downstream face of dam. 6" asbestos cement pipe is heavily silted in.
12. Seeps observed at toe of dam: water flowing.
13. Seep at toe of dam: water flowing.



CLIENT NO	22-0558
PROJ ENG	MRP
DRAWN BY	RB
DATE	JULY 1978

DUFRESNE-HENRY ENGINEERING CORP.

LOCATION OF PHOTOGRAPHS TAKEN JUNE 21, 1978

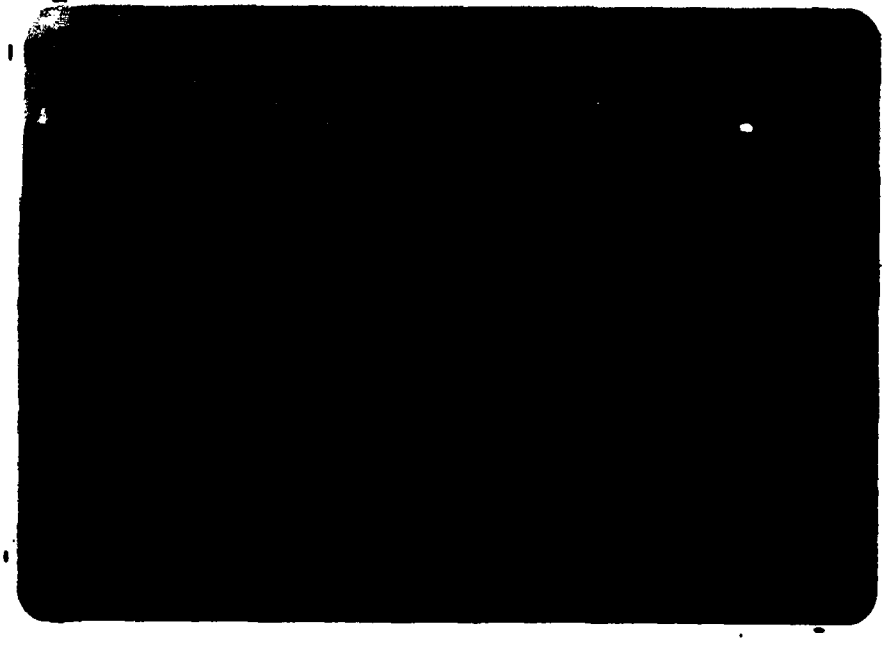
ROCKINGHAM VERMONT

FIGURE 5

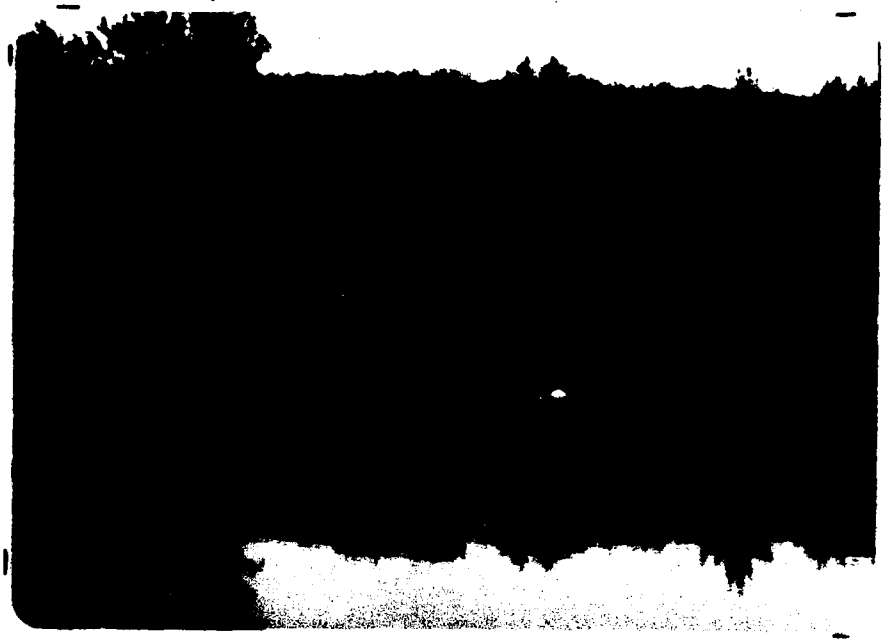
A 6002

#1 IDENTIFICATION SIGN AT POND SITE

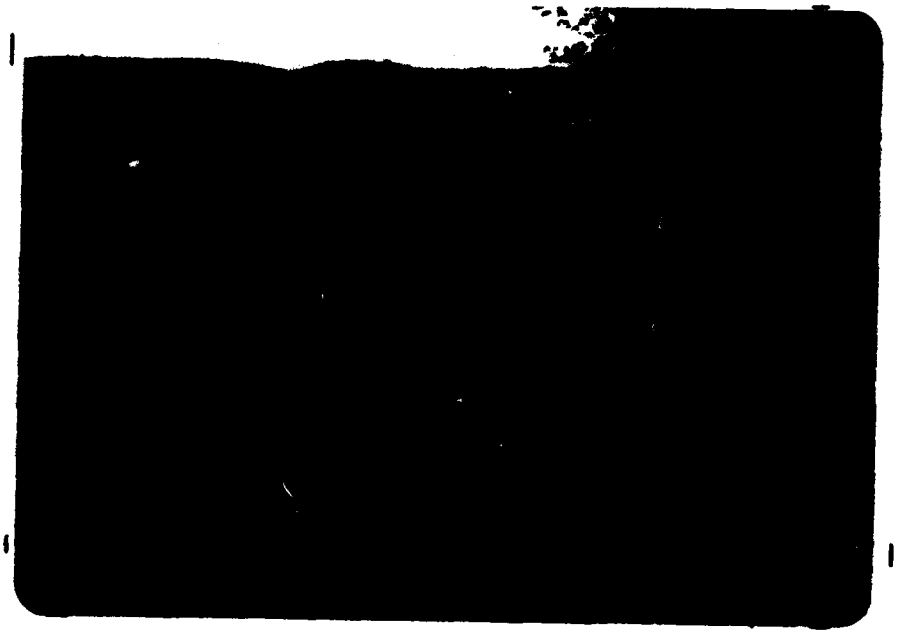
#2 VIEW OF DAM FROM RIGHT SIDE SOON AFTER COMPLETION OF THE ORIGINAL CONSTRUCTION IN THE EARLY 1800'S.



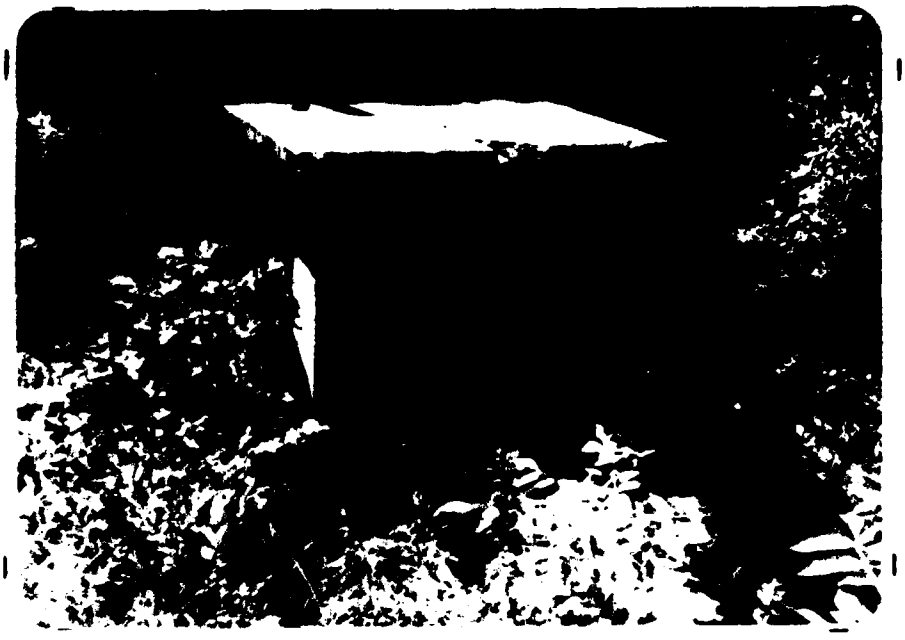
#3 SAME VIEW OF DAM FROM RIGHT SIDE JULY 1978; NOTE INCREASED FREE BOARD, SERVICE BRIDGE



#4 VIEW OF UPSTREAM FACE TOWARD THE RIGHT ABUTMENT FROM SERVICE BRIDGE



#5 VIEW OF DOWNSTREAM FACE FROM RIGHT ABUTMENT



#6 OUTLET STRUCTURE LOCATED AT RIGHT ABUTMENT

#7 36" DIAMETER OUTLET CONDUIT WITH HEAD WALL AND INDICATION OF DOWNSTREAM CHANNEL

#8 HEAD WALL AND DOWNSTREAM CHANNEL FOR ABANDONED STONE MASONRY OUTLET CONDUIT

#9 VIEW LOOKING INTO THE ABANDONED CONDUIT

#10 CRACK IN EAST FACE OF GATE HOUSE MASONRY FOUNDATION

#11

OUTLET OF DRAIN CONSTRUCTED NEAR LEFT ABUTMENT DOWNSTREAM FACE OF DAM. 6" ASBESTOS CEMENT PIPE IS HEAVILY SILTED IN

1	6	50	722.	21.	0.
1	7	10	722.	21.	0.
1	7	20	723.	21.	0.
1	7	30	723.	21.	0.
1	7	40	723.	21.	0.
1	7	50	724.	21.	0.
1	7	60	724.	21.	0.
1	8	10	724.	21.	0.
1	8	20	724.	21.	0.
1	8	30	725.	21.	0.
1	8	40	725.	21.	0.
1	8	50	725.	21.	0.
1	8	60	726.	21.	0.
1	9	10	726.	21.	0.
1	9	20	726.	21.	0.
1	9	30	726.	21.	0.
1	9	40	727.	21.	0.
1	9	50	727.	21.	0.
1	9	60	727.	21.	0.
1	10	10	728.	21.	0.
1	10	20	728.	21.	0.
1	10	30	728.	21.	0.
1	10	40	728.	21.	0.
1	10	50	729.	21.	0.
1	10	60	729.	21.	0.
1	11	10	729.	21.	0.
1	11	20	730.	21.	0.
1	11	30	730.	21.	0.
1	11	40	730.	21.	0.
1	11	50	730.	21.	0.
1	11	60	731.	21.	0.
1	12	10	731.	28.	0.
1	12	20	732.	55.	0.
1	12	30	733.	94.	0.
1	12	40	735.	124.	0.
1	12	50	737.	135.	0.
1	12	60	739.	139.	0.
1	13	10	741.	141.	0.
1	13	20	743.	148.	0.
1	13	30	745.	157.	0.
1	13	40	747.	164.	1.
1	13	50	749.	167.	1.
1	13	60	752.	168.	1.
1	14	10	754.	171.	1.
1	14	20	756.	181.	1.
1	14	30	759.	195.	1.
1	14	40	762.	206.	1.
1	14	50	765.	210.	1.
1	14	60	768.	211.	1.
1	15	10	771.	231.	1.
1	15	20	775.	306.	1.
1	15	30	781.	417.	1.
1	15	40	788.	499.	1.
1	15	50	795.	532.	1.
1	15	60	803.	542.	1.
1	16	10	810.	523.	1.
1	16	20	816.	445.	1.
1	16	30	820.	329.	1.
1	16	40	824.	243.	1.
1	16	50	827.	209.	1.
1	16	60	829.	199.	1.
1	17	10	832.	195.	1.
1	17	20	834.	185.	1.
1	17	30	837.	170.	1.
1	17	40	839.	160.	1.
1	17	50	841.	155.	1.

DVN*

HYDROGRAPH ROUTING

PULS RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.0	0.0	0.0	-1.

STORAGES	665.	826.	0.	0.	0.	0.	0.	0.	0.	0.
OUTFLOWS	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.

	TIME	EOP STOR	AVG IN	EOP OUT
1	0 10	720.	0.	0.
1	0 20	720.	1.	0.
1	0 30	720.	2.	0.
1	0 40	720.	2.	0.
1	0 50	720.	3.	0.
1	0 60	720.	3.	0.
1	1 10	720.	3.	0.
1	1 20	720.	3.	0.
1	1 30	720.	3.	0.
1	1 40	720.	3.	0.
1	1 50	720.	3.	0.
1	1 60	720.	3.	0.
1	2 10	720.	3.	0.
1	2 20	720.	3.	0.
1	2 30	720.	3.	0.
1	2 40	720.	3.	0.
1	2 50	720.	3.	0.
1	2 60	720.	3.	0.
1	3 10	720.	3.	0.
1	3 20	720.	3.	0.
1	3 30	720.	4.	0.
1	3 40	720.	4.	0.
1	3 50	720.	4.	0.
1	3 60	720.	4.	0.
1	4 10	720.	4.	0.
1	4 20	721.	4.	0.
1	4 30	721.	4.	0.
1	4 40	721.	4.	0.
1	4 50	721.	4.	0.
1	4 60	721.	4.	0.
1	5 10	721.	4.	0.
1	5 20	721.	4.	0.
1	5 30	721.	4.	0.
1	5 40	721.	4.	0.
1	5 50	721.	4.	0.
1	5 60	721.	4.	0.
1	6 10	721.	5.	0.
1	6 20	721.	9.	0.
1	6 30	721.	15.	0.
1	6 40	722.	19.	0.
1	6 50	722.	21.	0.

```
1 20 40. 1
1 20 50. 1
1 20 60. 1
1 21 10. 1
1 21 20. 1
1 21 30. 1
1 21 40. 1
1 21 50. 1
1 21 60. 1
1 22 10. 1
1 22 20. 1
1 22 30. 1
1 22 40. 1
1 22 50. 1
1 22 60. 1
1 23 10. 1
1 23 20. 1
1 23 30. 1
1 23 40. 1
1 23 50. 1
1 23 60. 1
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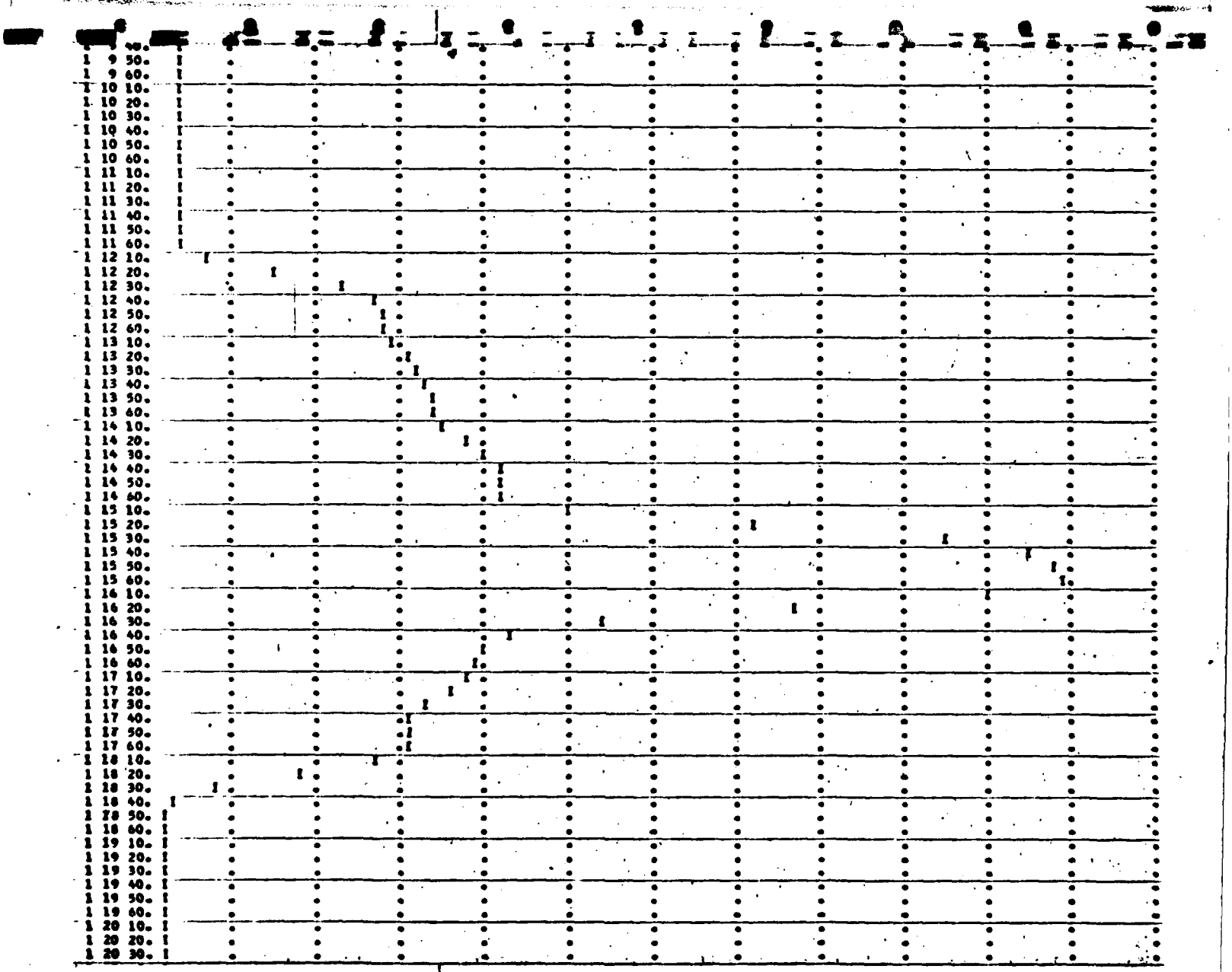


VF=

STATION 1

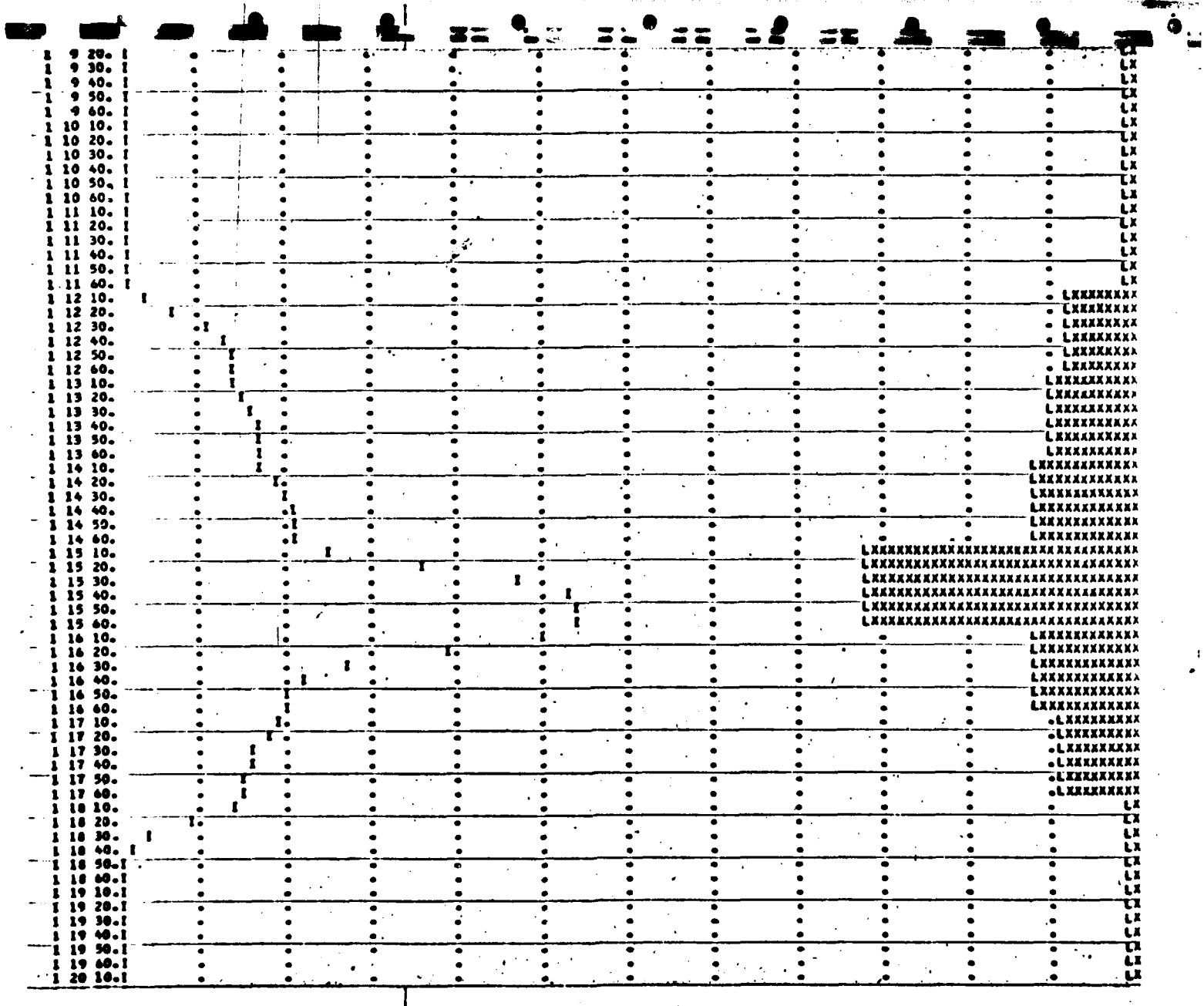
INFLOW=<, OUTFLOW=< AND OBSERVED FLOW=<

	0.	50.	100.	150.	200.	250.	300.	350.	400.	450.	500.	550.	0.
1	0 10												
1	0 20												
1	0 30												
1	0 40.												
1	0 50.												
1	0 60.												
1	1 10.												
1	1 20.												
1	1 30.												
1	1 40.												
1	1 50.												
1	1 60.												
1	2 10.												
1	2 20.												
1	2 30.												
1	2 40.												
1	2 50.												
1	2 60.												
1	3 10.												
1	3 20.												
1	3 30.												
1	3 40.												
1	3 50.												
1	3 60.												
1	4 10.												
1	4 20.												
1	4 30.												
1	4 40.												
1	4 50.												
1	4 60.												
1	5 10.												
1	5 20.												
1	5 30.												
1	5 40.												
1	5 50.												
1	5 60.												
1	6 10.												
1	6 20.												
1	6 30.												
1	6 40.												
1	6 50.												
1	6 60.												
1	7 10.												
1	7 20.												
1	7 30.												
1	7 40.												
1	7 50.												
1	7 60.												
1	8 10.												
1	8 20.												
1	8 30.												
1	8 40.												
1	8 50.												
1	9 60.												
1	9 10.												
1	9 20.												
1	9 30.												

RUNOFF MULTIPLIED BY 0.50

0.	1.	2.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	6.	12.	17.	20.
21.	21.	21.	21.	21.	21.	21.	21.	21.	21.
21.	21.	21.	21.	21.	21.	21.	21.	21.	21.
21.	21.	21.	21.	21.	21.	21.	21.	21.	21.
21.	21.	35.	75.	114.	133.	138.	139.	143.	153.
162.	167.	168.	168.	173.	188.	202.	209.	211.	212.
251.	361.	473.	525.	540.	544.	502.	387.	271.	216.
201.	197.	192.	178.	163.	156.	154.	154.	137.	88.
39.	16.	10.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.						

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	544.	233.	67.	67.	9647.
INCHES		9.62	11.08	11.08	11.08
AC-FT		115.	133.	133.	133.



NP=

STATION 1

INFLOW#<, OUTFLOW#X AND OBSERVED FLOW#*<

			0.	200.	400.	600.	800.	1000.	1200.	0.	0.	0.	0.	0.	0.
			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.2	PRECIP#L< AND EXCESS#X< 0.8	0.4	0.0
1	0	10													L
1	0	20													L
1	0	30													L
1	0	40													L
1	0	50													L
1	0	60													L
1	1	10													L
1	1	20													L
1	1	30													L
1	1	40													L
1	1	50													L
1	1	60													L
1	2	10													L
1	2	20													L
1	2	30													L
1	2	40													L
1	2	50													L
1	2	60													L
1	3	10													L
1	3	20													L
1	3	30													L
1	3	40													L
1	3	50													L
1	3	60													L
1	4	10													L
1	4	20													L
1	4	30													L
1	4	40													L
1	4	50													L
1	4	60													L
1	5	10													L
1	5	20													L
1	5	30													L
1	5	40													L
1	5	50													L
1	5	60													L
1	6	10.													LX
1	6	20.													LX
1	6	30.													LX
1	6	40.													LX
1	6	50.													LX
1	6	60.													LX
1	7	10.													LX
1	7	20.													LX
1	7	30.													LX
1	7	40.													LX
1	7	50.													LX
1	7	60.													LX
1	8	10.													LX
1	8	20.													LX
1	8	30.													LX
1	8	40.													LX
1	8	50.													LX
1	8	50.													LX
1	9	10.													LX

SUM 29.00 22.30 19280.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1087.	465.	134.	134.	19294.
INCHES		19.23	22.16	22.16	22.16
AC-FT		231.	266.	266.	266.

1	13	20	0.40	0.39	309.
1	13	30	0.40	0.39	324.
1	13	40	0.40	0.39	333.
1	13	50	0.40	0.39	336.
1	13	60	0.40	0.39	337.
1	14	10	0.50	0.49	347.
1	14	20	0.50	0.49	376.
1	14	30	0.50	0.49	405.
1	14	40	0.50	0.49	418.
1	14	50	0.50	0.49	422.
1	14	60	0.50	0.49	423.
1	15	10	1.27	1.25	502.
1	15	20	1.27	1.25	723.
1	15	30	1.27	1.25	946.
1	15	40	1.27	1.25	1050.
1	15	50	1.27	1.25	1079.
1	15	60	1.27	1.25	1087.
1	16	10	0.47	0.46	1005.
1	16	20	0.47	0.46	774.
1	16	30	0.47	0.46	541.
1	16	40	0.47	0.46	433.
1	16	50	0.47	0.46	403.
1	16	60	0.47	0.46	394.
1	17	10	0.37	0.36	384.
1	17	20	0.37	0.36	355.
1	17	30	0.37	0.36	326.
1	17	40	0.37	0.36	313.
1	17	50	0.37	0.36	309.
1	17	60	0.37	0.36	308.
1	18	10	0.03	0.02	273.
1	18	20	0.03	0.02	171.
1	18	30	0.03	0.02	78.
1	18	40	0.03	0.02	32.
1	18	50	0.03	0.02	20.
1	18	60	0.03	0.02	16.
1	19	10	0.03	0.02	16.
1	19	20	0.03	0.02	16.
1	19	30	0.03	0.02	16.
1	19	40	0.03	0.02	16.
1	19	50	0.03	0.02	16.
1	19	60	0.03	0.02	16.
1	20	10	0.03	0.02	16.
1	20	20	0.03	0.02	16.
1	20	30	0.03	0.02	16.
1	20	40	0.03	0.02	16.
1	20	50	0.03	0.02	16.
1	20	60	0.03	0.02	16.
1	21	10	0.03	0.02	16.
1	21	20	0.03	0.02	16.
1	21	30	0.03	0.02	16.
1	21	40	0.03	0.02	16.
1	21	50	0.03	0.02	16.
1	21	60	0.03	0.02	16.
1	22	10	0.03	0.02	16.
1	22	20	0.03	0.02	16.
1	22	30	0.03	0.02	16.
1	22	40	0.03	0.02	16.
1	22	50	0.03	0.02	16.
1	22	60	0.03	0.02	16.
1	23	10	0.03	0.02	16.
1	23	20	0.03	0.02	16.
1	23	30	0.03	0.02	16.
1	23	40	0.03	0.02	16.
1	23	50	0.03	0.02	16.
1	23	60	0.03	0.02	16.

1	2	20	0.02	0.01	8.
1	2	30	0.02	0.01	4.
1	2	40	0.02	0.01	6.
1	2	50	0.02	0.01	6.
1	2	60	0.02	0.01	4.
1	3	10	0.02	0.01	6.
1	3	20	0.02	0.01	7.
1	3	30	0.02	0.01	7.
1	3	40	0.02	0.01	8.
1	3	50	0.02	0.01	8.
1	3	60	0.02	0.01	8.
1	4	10	0.02	0.01	8.
1	4	20	0.02	0.01	8.
1	4	30	0.02	0.01	8.
1	4	40	0.02	0.01	8.
1	4	50	0.02	0.01	8.
1	4	60	0.02	0.01	8.
1	5	10	0.02	0.01	8.
1	5	20	0.02	0.01	8.
1	5	30	0.02	0.01	8.
1	5	40	0.02	0.01	8.
1	5	50	0.02	0.01	8.
1	5	60	0.02	0.01	8.
1	6	10	0.06	0.05	12.
1	6	20	0.06	0.05	23.
1	6	30	0.06	0.05	35.
1	6	40	0.06	0.05	40.
1	6	50	0.06	0.05	42.
1	6	60	0.06	0.05	42.
1	7	10	0.06	0.05	42.
1	7	20	0.06	0.05	42.
1	7	30	0.06	0.05	42.
1	7	40	0.06	0.05	42.
1	7	50	0.06	0.05	42.
1	7	60	0.06	0.05	42.
1	8	10	0.06	0.05	42.
1	8	20	0.06	0.05	42.
1	8	30	0.06	0.05	42.
1	8	40	0.06	0.05	42.
1	8	50	0.06	0.05	42.
1	8	60	0.06	0.05	42.
1	9	10	0.06	0.05	42.
1	9	20	0.06	0.05	42.
1	9	30	0.06	0.05	42.
1	9	40	0.06	0.05	42.
1	9	50	0.06	0.05	42.
1	9	60	0.06	0.05	42.
1	10	10	0.06	0.05	42.
1	10	20	0.06	0.05	42.
1	10	30	0.06	0.05	42.
1	10	40	0.06	0.05	42.
1	10	50	0.06	0.05	42.
1	10	60	0.06	0.05	42.
1	11	10	0.06	0.05	42.
1	11	20	0.06	0.05	42.
1	11	30	0.06	0.05	42.
1	11	40	0.06	0.05	42.
1	11	50	0.06	0.05	42.
1	11	60	0.06	0.05	42.
1	12	10	0.33	0.32	70.
1	12	20	0.33	0.32	149.
1	12	30	0.33	0.32	229.
1	12	40	0.33	0.32	266.
1	12	50	0.33	0.32	276.
1	12	60	0.33	0.32	279.
1	13	10	0.40	0.39	286.

HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01

SPILLWAY DESIGN FLOOD
MINARD'S POND
PHASE I DAM SAFETY INVESTIGATION

JOB SPECIFICATION

NQ	NMR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	10	1	0	0	0	2	0	0

JOPER NWT
3 0

SUB-AREA RUNOFF COMPUTATION

PROBABLE MAXIMUM 24-HOUR PRECIPITATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.22	0.0	0.22	1.00	0.500	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	18.00	111.00	123.00	133.00	0.0	0.0	0.0

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.35	0.10	0.0	0.33

UNIT HYDROGRAPH DATA
TP= 0.31 CP=0.68 NTA= 0

RECESSION DATA
STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 2.66 AND R= 0.88 INTERVALS

UNIT HYDROGRAPH 6 END-OF-PERIOD ORDINATES, LAG= 0.31 HOURS, CP= 0.67 VOL= 1.00
103. 288. 292. 136. 38. 10.

END-OF-PERIOD FLOW

	TIME	RAIN	EXCS	COMP Q
1	0 10	0.02	0.01	1.
1	0 20	0.02	0.01	3.
1	0 30	0.02	0.01	5.
1	0 40	0.02	0.01	5.
1	0 50	0.02	0.01	6.
1	1 0	0.02	0.01	6.
1	1 10	0.02	0.01	6.
1	1 20	0.02	0.01	6.
1	1 30	0.02	0.01	6.
1	1 40	0.02	0.01	6.
1	1 50	0.02	0.01	6.
1	2 0	0.02	0.01	6.
1	2 10	0.02	0.01	6.

APPENDIX D

#12 SEEPS OBSERVED AT TOE OF DAM: WATER FLOWING

#13 SEEP AT TOE OF DAM: WATER FLOWING

1	17	[illegible]	[illegible]	[illegible]	[illegible]
1	18	[illegible]	845.	145.	1.
1	18	20	846.	14.	1.
1	18	30	848.	84.	1.
1	18	40	848.	28.	1.
1	18	50	848.	13.	1.
1	18	60	848.	9.	1.
1	19	10	848.	8.	1.
1	19	20	848.	8.	1.
1	19	30	849.	8.	1.
1	19	40	849.	8.	1.
1	19	50	849.	8.	1.
1	19	60	849.	8.	1.
1	20	10	849.	8.	1.
1	20	20	849.	8.	1.
1	20	30	849.	8.	1.
1	20	40	849.	8.	1.
1	20	50	849.	8.	1.
1	20	60	849.	8.	1.
1	21	10	850.	8.	1.
1	21	20	850.	8.	1.
1	21	30	850.	8.	1.
1	21	40	850.	8.	1.
1	21	50	850.	8.	1.
1	21	60	850.	8.	1.
1	22	10	850.	8.	1.
1	22	20	850.	8.	1.
1	22	30	850.	8.	1.
1	22	40	850.	8.	1.
1	22	50	850.	8.	1.
1	22	60	851.	8.	1.
1	23	10	851.	8.	1.
1	23	20	851.	8.	1.
1	23	30	851.	8.	1.
1	23	40	851.	8.	1.
1	23	50	851.	8.	1.
1	23	60	851.	8.	1.
		SUM			93.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1.	1.	1.	1.	93.
INCHES		0.05	0.11	0.11	0.11
AC-FT		1.	1.	1.	1.

1

OVF =

STATION 1

INFLOW=<, OUTFLOW=0< AND OBSERVED FLOW=*<

	0.	100.	200.	300.	400.	500.	600.	0.	0.	0.	0.	0.	0
I	0 10I												
1	0 20I												
1	0 30I												
1	0 40I												
1	0 50I												
1	0 60I												
1	1 10I												
1	1 20I												
1	1 30I												
1	1 40I												
1	1 50I												
1	1 60I												
1	2 10I												
1	2 20I												
1	2 30I												
1	2 40I												
1	2 50I												
1	2 60I												
I	3 10I												
1	3 20I												
1	3 30I												
1	3 40I												
1	3 50I												
1	3 60I												
1	4 10I												
1	4 20I												
1	4 30I												
1	4 40I												
1	4 50I												
1	4 60I												
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1	5 20I												
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1	5 40I												
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1	5 60I												
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1	6 200I												
1	6 300I												
1	6 400 I												
1	6 500 I												
1	6 600 I												
1	7 100 I												
1	7 200 I												
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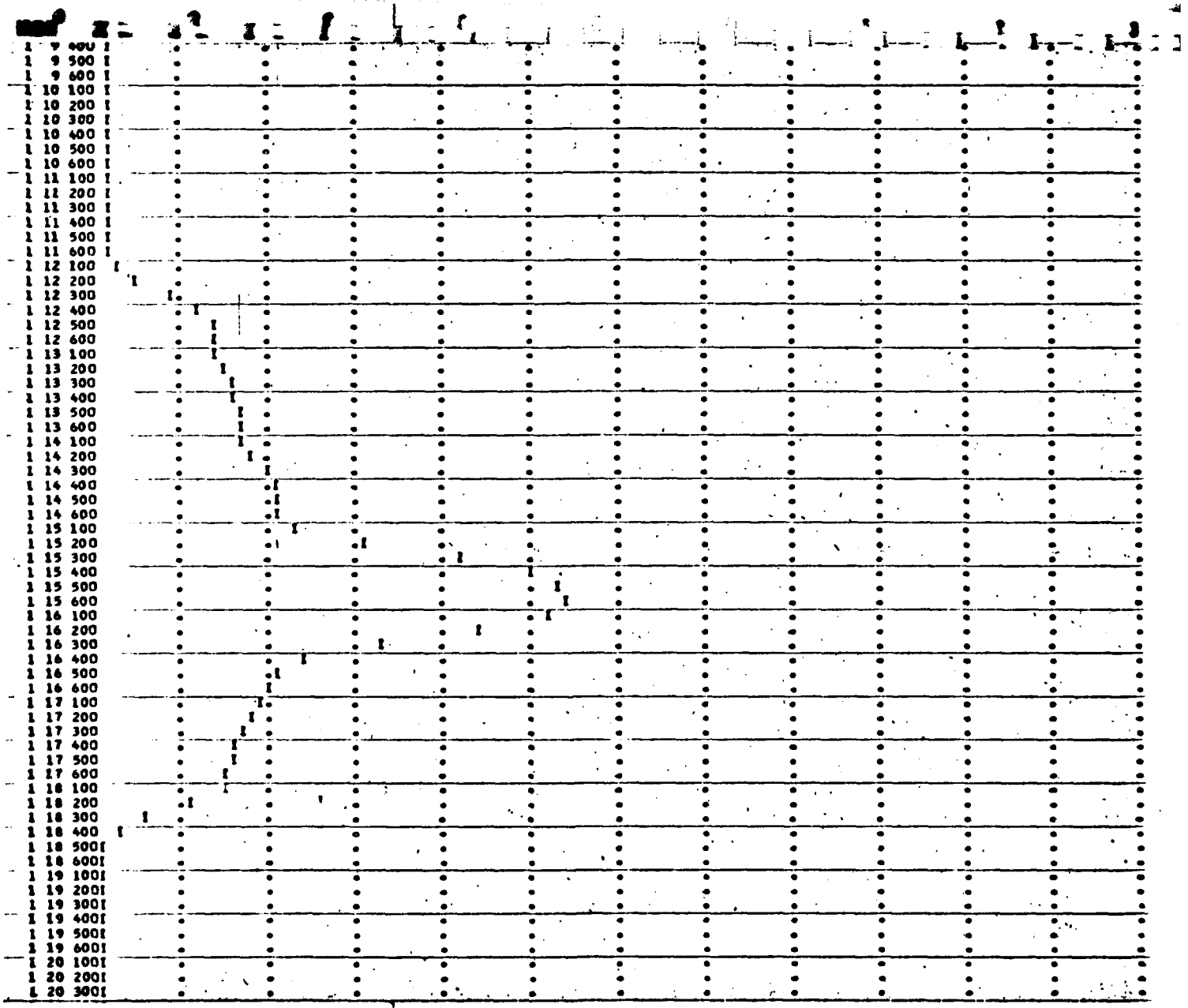
1	9 300 I												



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1 20 400I
1 20 500I
1 20 600I
1 21 100I
1 21 200I
1 21 300I
1 21 400I
1 21 500I
1 21 600I
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1 22 200I
1 22 300I
1 22 400I
1 22 500I
1 22 600I
1 23 100I
1 23 200I
1 23 300I
1 23 400I
1 23 500I
1 23 600I
```
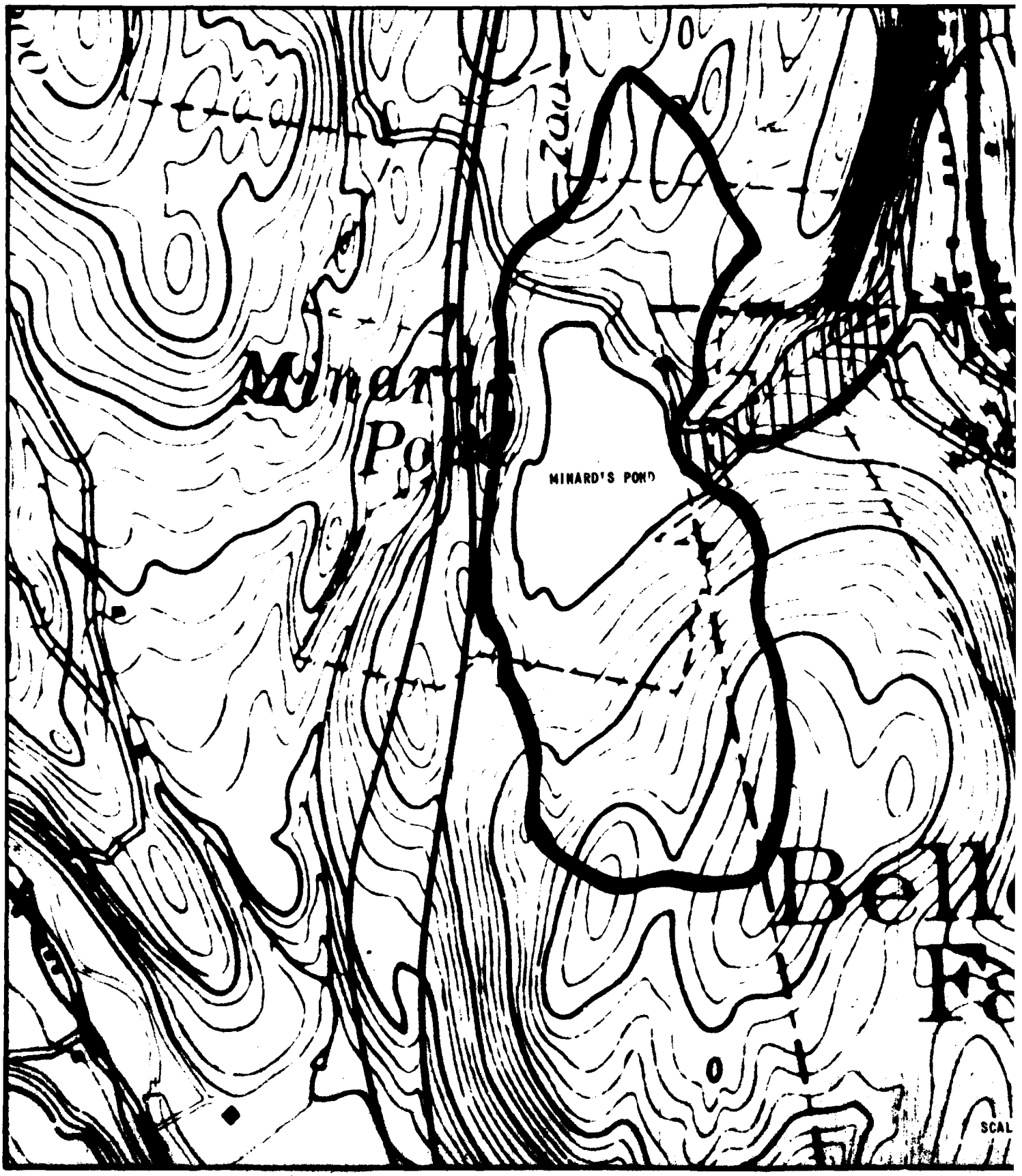
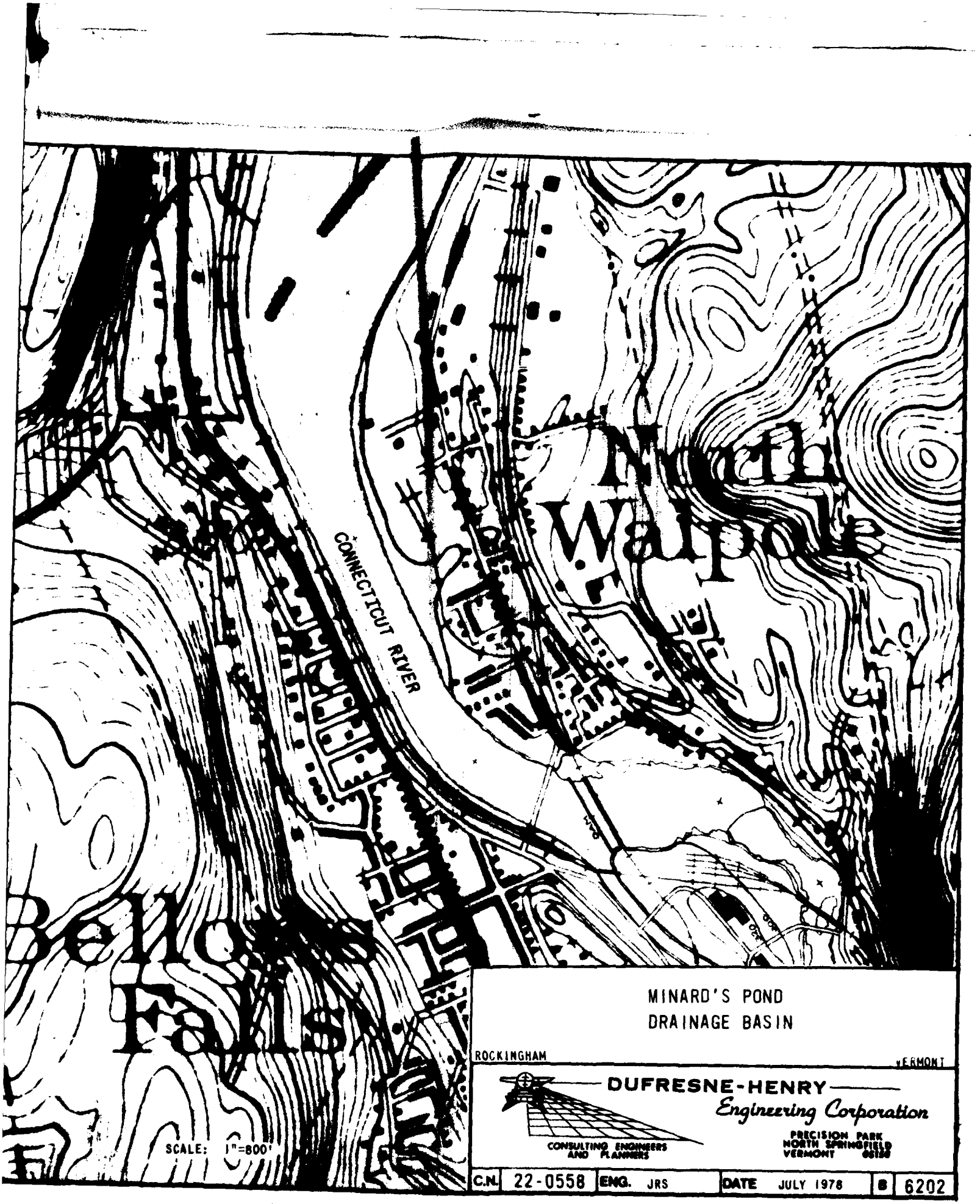

RUNOFF SUMMARY; AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	544.	233.	67.	67.	0.22
ROUTED TO	1	1.	1.	1.	1.	0.22


MINARD'S POND



MINARD'S POND
DRAINAGE BASIN

ROCKINGHAM VERMONT

DUFRESNE-HENRY
Engineering Corporation
CONSULTING ENGINEERS AND PLANNERS
PRECISION PARK
NORTH SPRINGFIELD
VERMONT 05150

C.N.	22-0558	ENG.	JRS	DATE	JULY 1978	S	6202

APPENDIX E

Information as Contained in the National Inventory of Dams

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
VT	150	NED	VT	025	01				MINARDS POND DAM	4308.6	7228.0	18AUG78

POPULAR NAME	NAME OF IMPOUNDMENT
	MINARDS POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	03	TR-CONNECTICUT RIVER	BELLOWS FALLS	0	3831

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1920	S	27	25	826	665	NED	N	N	N	N	14AUG78

REMARKS

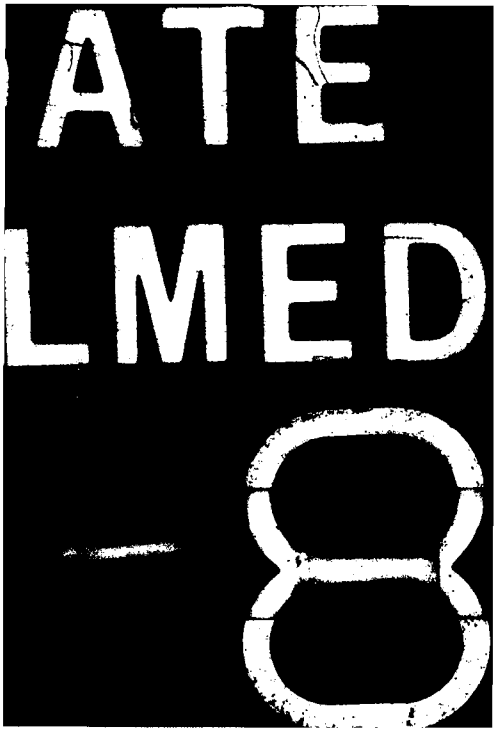
O/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	700	N			27000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
BELLOWS FALLS VILLAGE C.		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
DUFRESNE-HENRY ENG CORP	21JUN78	PL 92-367

REMARKS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